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Report of the Chief of the Forest Service, 1959

United States Department of Agriculture

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ROCKY MOUNTAIN STATION

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Issued November 1960

This Report Covers Calendar Year Activities Unless Otherwise Identified. Where Records Are on a Fiscal Year Basis, They Are So Reported.

Report of the Chief of the Forest Service, 1959

Introduction

This was a remarkable year for forestry. It was a year of change, a year of readjustment to rapid growth and changing habits of a whole population. The Forest Service was at all levels girding to cope with a new era. There were many problems, and therefore, in Forest Service philosophy, many challenging opportunities. And there were some outstanding accomplishments.

The new era was beginning to emerge in the management of forest lands in general and national forests in particular. Dominant in the changed environment, the new era, is the impact on many fronts of an enlarging population. Stresses and pressures on all land are beginning to be felt. More people are requiring more land for various nonforestry purposes—bigger housing projects, highways, power developments, and airports. At the same time they are requiring more products and services from limited forest areas.

On national forests this trend is best seen in the phenomenal rise in recreation use, the fastest growing activity on these public lands. Recreation though is merely leading the trend toward greater demands on all the renewable resources of the forest. The trend is evident in many facets of the economy. It can be expressed in an equation: MP+MLM=MD (*more people* with more *money*, *leisure*, and *mobility* mean *more demands*).

The Forest Service proposes to meet this challenge with *Operation Multiple Use*, the Program for the National Forests. It believes that a more intense and skillful application of multiple use is the best answer to growing pressures from a larger population.

Therefore, out in the forests greater emphasis was being placed on multiple use management and its many benefits to the whole public. Along with more multiple use on the ground, renewed efforts were underway to achieve better public understanding of what the principle means and what it aims to accomplish. Fortunately there was heartening evidence that both the practice and theory of multiple use forestry were coming to be appreciated by a larger majority of the American people.

All of these changes made it a year of great challenge. And overall it was a year of progress. The following highlights are only a few of the accomplishments and problems which made it memorable.

SOME HIGHLIGHTS OF 1959

Research: spotlight on the unknown.—Forestry research embraces problems of great variety and magnitude. Scientists are dealing with all manner of questions that must be answered to make multiple use forestry work. They continuously probe into new aspects of protecting, managing, and using the wood, water, forage, wildlife, and recreation resources of the Nation. As a larger population makes greater demands on forest resources, research is being stepped up to meet the bigger challenge.

Here are some research areas in which progress and greater promise were evident during the year. Serious disease problems in seed and transplant beds can now be overcome by using new chemical treatments. The reduction in seedling losses which had occurred in the past has assured adequate trees for the large planting programs nationwide. Work at the Forest Genetics Institutes has proved that trees with superior growth, form, wood quality, and pest resistance can be scientifically bred. Biological and chemical control of insect and disease pests made significant advances.

Scientific management of watersheds and forest rangelands moved ahead. A number of studies in the West have proved that manipulation of forest vegetation in snow country can increase the yield of water 10 to 20 percent.

Pulp and paper research showed that a good quality mimeograph paper can be made from several western trees not previously used; new ways were devised to use more hardwood and low-grade trees in making liner board and other paper products. A long search to convert wood and wood waste to various industrial chemicals had reached the pilot plant stage. Marked advances were made in direct seeding of southern pines by coating seeds with a mixture that repels seed-eating birds and rodents. To better understand and accommodate expanding recreation use of

national forests, research in forest recreation was strengthened and intensified.

Antibiotics control blister rust.—Antibiotic drugs, so beneficial in the battle against human disease, have for the first time been successfully adapted to the control of a tree disease. Two in particular—acti-dione and phytoactin—have shown most promise. Acti-dione, so far applied only by manual spray to the trunks, has shown that it kills blister rust on white pine. This is the most destructive disease attacking this valuable pine, and it has destroyed millions of these trees in the West. Now there is good promise that antibiotics will also be effective as an aerial spray, which would greatly speed up and simplify control of this disease on large areas.

This breakthrough is a boon to western white pine management; it can save and bring through to maturity millions of acres of pine forests that might have been destroyed without it. During 1958 and 1959 more than 4 million trees on some 18,000 acres in the northern Rockies were treated with acti-dione.

Operation multiple use.—In terms of potential national-forest development and resulting benefits to the public, the Program for the National Forests was the biggest event of the year. Popularly called *Operation Multiple Use*, the plan was transmitted to Congress by Secretary Ezra Taft Benson March 24, 1959. Reaction was almost unanimous in favor of it—by Congress, by organizations concerned with natural resources, and by much of the public.

Briefly, Operation Multiple Use is a blueprint to assure that vital national-forest resources would contribute their full potential to the people in pace with the Nation's expanding population and economy. The program will enable these public forests to meet the rising demands that a larger population is making on them. It encompasses a 10–15 year expanded management and development operation, which would meet present needs as well as prepare to meet still greater needs of a larger population in the future. Multiple use management would be intensified about double the present levels, to enhance and enlarge public benefits from the several renewable resources—the water, timber, recreation, range, and wildlife habitat.

Recreation use up 19 percent.—Still more people sought out national forests for rest and play—to the tune of 13 million more visits than last year. Recreation use of these public lands, a good barometer of the national trend to more leisure and outdoor play, moved upward again in the biggest annual increase in 13 years. It was a 19-percent jump over the previous year. Visits totaled 81.5 million, as against 68.4 million in 1958.

The most popular kind of recreation was simply people going into the forests to enjoy the environment. Popularity of other pursuits followed in this order: picnicking, fishing, hunting, camping, winter sports, swimming, hiking and riding, and enjoyment of wilderness.

While the Forest Service welcomes more visitors as an opportunity to better serve the American people, facilities are being severely taxed and some areas are seriously overcrowded. Efforts are being made all along the line for continued integration of recreation with the other resources in the general readjustment to a new era in national-forest management.

Record timber harvest.—Under multiple use and sustained yield principles, more timber was harvested from national forests in fiscal 1959 than ever before. The record cut of 8.3 billion board feet brought $115,808,000 in cash receipts. This was a 30-percent increase over the previous year in board feet harvested, and a $29.5-million rise in receipts. It was also the greatest 12-month increase ever reported. Timber receipts for 1950, only 9 years ago, amounted to $29,379,000.

The sale of timber, which is not reflected in receipts until the next year or later, was pushed to a record volume—9.4 billion board feet. In addition, 6 million cords of pulp timber awarded in Arizona was the largest timber sale ever made in the 48 contiguous States. The sale will mean an important new industry for that State, supplying a new paper mill to produce a daily capacity of 150 tons of kraft paper and 210 tons of newsprint. Another dividend will be improved forestry, since the pulp timber consists of small or low-quality trees that will be thinned out to improve the rest of the forest.

Cash receipts top $124 million.—Besides other valuable benefits these public lands afford, cash returns in 1959 came to $124,067,000—about $30 million more than receipts for the previous fiscal year. Total Forest Service receipts 9 years ago (1950) were $34,485,000.

As usual the biggest producer of cash receipts was national-forest timber. Land Utilization Projects, managed by the Forest Service, accounted for $1,919,000; grazing permits on national-forest lands brought in $3,751,000; land and power use permits some $2.5 million; and the remainder came from mineral leases, cropping, haying, sale of seeds, and recreation concessions. Of the gross receipts, 25 percent was returned to the States for counties in which the lands are located.

This is striking evidence that national forests under more intensive multiple use are producing increasingly greater cash returns while providing the people with those valuable benefits not countable in dollars: stabilized soils, outdoor recreation, wilderness and scenic beauty, water for farms and industry, and ideal grounds for hunters and fishermen.

Millionth acre of range improved.—A significant mark was passed during the year in improv-

ing the grazing resource: the millionth acre of national-forest rangeland was rehabilitated either by seeding or through control of undesirable plants. By June 30, 1959, a total of 1,122,842 acres had been treated. Of this amount, about 750,000 acres were treated in the period 1950–1959. As encouraging as this progress is, there remain 4,400,000 acres on which similar revegetation measures need to be applied.

Two billion trees planted.—Planting in fiscal 1959 on all lands reached the remarkable record of more than 2 billion trees on 2,151,743 acres. This is an increase of 37 percent, or substantially in excess of a half million acres more than were planted in 1958. In 1950, fewer than a half million acres was the annual planting.

One-third (about 700,000 acres) of the 1959 planting was cropland placed under Conservation Reserve in 10-year contracts. Of the total 1959 planting, 89 percent (1,915,718 acres) was on privately owned land, and about one-fourth of this was on larger ownerships held by forest and other industries. Not nearly enough was planted on small ownerships. Planting and seeding on Federal lands—including 112,000 acres on national forests—totaled 169,000 acres, a 23-percent increase over the previous year.

Small forest problem unsolved.—The big problem continued to be that of getting more trees and better forestry on the small woodland tracts. Despite an excellent tree-planting record, more planting and management are urgently needed, especially on some 260 million acres—more than half the country's commercial forest land—in the hands of a host of small property holders. At the 1958 rate of planting, it will take an estimated 44 years to put growing trees on 40 million acres of the most plantable areas of this private land. If this area were planted now, much of it could have merchantable trees by the year 2000 when the greatly expanded population will need them.

As a result of Forest Service-sponsored nationwide meetings in 1958, much information on the problem was gathered and has been thoroughly analyzed. From this concentrated study along with special research, the Forest Service has the most complete compilation of data ever assembled on the small ownership situation, the problems, and programs relating to it.

It is a national problem. It is the Nation's number one opportunity to assure that a larger population will have the wood it will need in the future. To get started on a solution will require leadership of a high order, both at the local level and the top echelons of government.

Multiple use gains in popular support.—In the midst of the emerging new era, it was gratifying to note popular support for the multiple use and sustained yield management principles. The Service has long enjoyed good relations and loyal backing with users of national forests as well as a large portion of the general public. But renewed interest and support were evident in more letters to local newspapers, editorials, resolutions of endorsement by conservation and other organized groups, and enthusiastic statements as well as firm backing by members of Congress. Also, private and industrial forestry groups were coming to champion multiple use as the most enlightened way to make forest land serve its best purpose.

The 1950's have been a decade of great forestry advances for America. As 1959 ended the Forest Service turned to the new decade, confident that it will meet the challenge of the future; that through action programs and readjustments national forests will continue to serve the needs and desires of a larger public in this new era of forestry.

Forestry Research

Throughout the country people are recognizing as never before that forest land needs to be protected and managed for more complete use of all its products and services. This trend is apparent in more forest owners applying more intensive and scientific management; in forest managers' efforts to prevent even small losses from fire, insects, and disease; and in the steadily increasing utilization by forest industries of waste material previously lost in the woods or at the mill. Anxiety over unstable and inadequate water supplies is focusing attention on grazing and logging practices on critical upstream watersheds. Public need for more outdoor recreation has spurred efforts to develop forest areas and facilities specifically for this use. All of these indicate some of the activities and problems involved, and point to a bigger job ahead for forestry research.

From research comes knowledge to meet the growing demands of a growing population. The more intensive the forestry practice, the more thoroughly must the underlying physical, biological, and economic interrelationships that control it be understood. Forest Service research scientists in the past year made many contributions toward better understanding of the intricate problems in the broad field of forestry. A few of these are described briefly in the following pages.

FOREST PRODUCTS UTILIZATION

Structural Design

New ways of using the unique properties of wood as a structural material are constantly being developed and old ways improved. Recommended building code requirements for wood or

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wood-base materials were published to provide a sound basis for development of actual building codes. Safer use of wood in timber structures subjected to excessive fatigue or repeated loads has been made possible by new information on adequacy of design values. A new laboratory and field research project will study distribution of wheel loads on timber highway bridge decks to provide a more accurate basis for design.

Painted Wood

Laboratory studies have shown that the leaching action of water is fully as important in the weathering of paint films as is exposure to sunshine. This new knowledge is being applied in further studies to gain a new insight on the deterioration of paints—how they become soiled or attacked by fungi, lose their initial gloss, become chalky, develop fissures, curl and flake, and finally disintegrate.

Pulp and Paper Research

How to put noncommercial tree species to work and extend the versatility of others continued to to receive attention. Research has shown that a good quality mimeograph paper can be made from a variety of western woods not previously used. Other experiments have developed methods for using a mixture of western species to produce good-quality groundwood, bleached sulfate, and viscose-grade sulfite pulps. Hardwood pulp using sweetgum as a base can now be substituted for part of the usual softwood pulps used in making liner board, a large tonnage item, thus reducing raw material costs as well as demand on softwood supplies. In another development it has been found that coated printing papers can now be made successfully by using up to 20 percent of mixed hardwood cold soda pulps.

Wood Chemistry and Residues

Further progress was made in studying the complex chemical makeup of wood, and in putting to work the knowledge gained. Laboratory experiments have now revealed the optimum conditions—temperature, pressure, acid concentration, and reaction time—for producing various chemicals from wood. This information has advanced the utilization of wood for the production of furfural, levulinic acid, formic and acetic acid, and other chemicals. During the past year the reaction conditions required to convert actual liquid wastes from a large fiber plant were determined. Further investigations have reached the pilot plant stage and design criteria for a commercial plant are being developed.

Veneer Flooring

A process developed by the Forest Products Laboratory about 10 years ago has paved the way for commercial production of wood veneer floors. This was a method of drying veneer in a hot press under restraint to prevent normal shrinkage, as when attached to a concrete or plywood subfloor with special mastic adhesives. Several manufacturers have recently gone into production using random length strips or 9-inch squares, either prefinished or unfinished.

FOREST ECONOMICS

Progress on Forest Survey

During the past year 53 million acres were inventoried by the nationwide Forest Survey to provide facts regarding the condition of forest resources, timber growth and cut, and trends in timber volume and quality. Except for the interior of Alaska, where survey work is now underway, nearly all forest land in the United States has been inventoried at least once. Resurveys to keep information up to date and to determine changes in timber resources, forestry problems, and industrial opportunities are being made periodically in all regions.

Virginia's Timber Situation Appraised

As an example of Forest Survey findings, recent data for Virginia show that low-quality hardwoods are increasing and replacing pine over wide areas. This is offset in part by hardwood control and planting of pine, and the natural seeding-in of pine on abandoned farmland. As a result the pine resource is just about holding its own. Virginia's forests have the capacity to grow 50 to 75 percent more timber; but to realize this potential will require removal of low-quality hardwoods on several million acres to make room for pine and better hardwoods. Planting on much of this area and on about 1½ million acres of abandoned cropland will also be essential to achieve this goal.

Idle Lands—Investment Opportunities

Investment opportunities for crop, pasture, and forest production on idle lands in Potter County, Pa., were analyzed in a cooperative study with the Pennsylvania Agricultural Experiment Station and the USDA Agricultural Research Service. Possibilities for investment in one or more forest management alternatives proved to be promising on 30,000 of the 40,000 idle acres in the area. On these lands average annual rates of return on forestry investments ranged from 5.6 to 14.2 percent on open lands having no costs of clearing and land acquisition, and from 4.0 to 11.6 percent where land acquisition and land clearing are required.

Woodland Owners Surveyed

Apparently the average forest landowner's interest in forestry is in proportion to the size of his woodlands: generally the owner of a small tract is not much interested in applying good management, but the larger his tract the more interested

he is in making his forest land pay. Pilot ownership studies in seven eastern States have provided information on characteristics of small woodland owners, factors which influence their use of land, and the response to and effectiveness of various forestry programs for aiding forest owners. The majority of owners in the areas sampled were farmers, and most owned less than 100 acres of woodland. Most of them were more than 50 years of age, lived close to their properties, and had acquired them by purchase. Relatively few have applied forestry measures on their lands or used the services of professional foresters. Only a small percentage have obtained ACP payments for forestry purposes, sought credit or insurance on timber resources, leased their woodland for management purposes, or considered forest taxes a deterrent. Results indicated that owners' interest in forestry and good management practices increases directly with size of woodland owned.

Forest Tax Laws Studied

Forest taxation was studied in several States in consultation with State tax officials and forest owner representatives. A tax study in Wisconsin, undertaken with the State Conservation Department, indicated that under both the Forest Crop Law (a yield tax) and the general property tax, the ratio of taxes to net income before taxes is significantly higher on forest property than on other classes of property. Study results provide an improved basis for appraisal of pending legislation involving changes in the Forest Crop Law.

RANGE MANAGEMENT AND WILDLIFE HABITAT

Range Can Be Restored

Convincing evidence of the restorative powers of good management has been compiled from research data in northeastern Oregon. Here a once badly depleted subalpine range has been properly grazed for 20 years. Changes in vegetation and soil have been charted and comparison of plot records and photographs shows a number of interesting developments. Accelerated erosion, prominent in 1938, has been arrested and erosion pavement is being revegetated by secondary species. Vegetation cover has increased 30 percent and the climax grass is being reestablished. Herbage production has tripled, although on most of the range the species composition remained about the same. Changes in plant cover have been found to be closely related to the amount of surface soil lost prior to 1938. Information such as this provides a basis for prescribing specific management practices to correct unsatisfactory range conditions on individual vegetation types.

Forest Thinning and Deer Forage

The interrelation of forest density and deer browse production is illustrated by results from an experiment in Louisiana. The study area was a loblolly pine plantation that had been thinned to various degrees in 1948 and 1953. By 1958 the production of palatable plants had shown sharply divergent response to the different thinning intensities. Ovendry yields ranged from 90 pounds per acre where light thinning kept the plantation stocked at 100 square feet of basal area per acre, to 136 pounds where heavy thinning reduced the stand to 70 square feet.

Dual Forest Land Use in Florida

First-year results of a study in south Florida shed light on the potential compatibility of beef and timber production on the same area. Sixty days after planting, 30 percent of the longleaf and slash pine seedlings were severely damaged by cattle in range areas stocked at a high level. By contrast, only 1-percent damage occurred where stocking levels were kept low. It is significant that this lower level of livestock use also shows promise of yielding the highest calf crop and the heaviest weaning weight.

FOREST RECREATION RESEARCH

New Project Started

During 1959 substantial progress was made in accelerating a forest recreation research program. The first research center having forest recreation research as a major part of its program was established at Warren, Pa. Initial research effort is being concentrated on problems associated with the development and management of recreation areas. The research center and the Allegheny National Forest are working together to develop the Biddle Demonstration Forest to illustrate up-to-date methods of forest land management, techniques in recreation research, and practical multiple use.

More Reliable Use Data

Work is going forward in California to devise a statistical sampling method for obtaining more reliable estimates of recreational use of the national forests, and methods for evaluating recreational potentials for different types of land.

FOREST MANAGEMENT

Pine Management Pays

A 958-acre understocked pine hardwood forest on the Crossett Experimental Forest has been closely managed on a selection system for 18 years. Records and observations from this second-growth forest show that at 1937 values, return on the investment has been equal to 37 percent an-

nually. Using 1955 values, net cash returns would have averaged $12.82 per acre annually for the 18 years; earnings would have been at the rate of 5.9 percent per year for interest on investment, risk, and profit.

Released Sugar Pine Responds

Natural reproduction of sugar pine, a preferred species, is often present in mixed conifer stands of the Pacific Northwest before cutting. Yet, because of damage to these seedlings during harvesting, it has frequently been necessary to plant cutover areas. Modification of logging and slash disposal practices might be justifiable if it could be demonstrated that the protected seedlings would respond to release. Recently completed research has shown that sugar pine seedlings do increase in height growth after the removal of the overstory. This now opens the way to adjusting harvesting methods to reduce costly planting and seedling operations.

Direct Seeding

Direct seeding has a special appeal to forest managers. However, the apparent simplicity of its use is deceptive and consistent success requires much scientific knowledge. Years of persistent experimentation in a number of regions are now paying off.

The most spectacular success has been achieved with southern pines. Here more than a decade of study devoted to seed treatment, favorable germination conditions, and season, rate and method of sowing, has recently transformed a risky gamble into a broadly applicable practice. In 1959, for example, the acreage seeded in Louisiana amounted to more than 70 percent of the area planted.

Research elsewhere is developing new knowledge which will guide direct seeding of other species. In the Lake States conditions necessary for successful seeding of balsam fir have been defined. In the Southeast better methods of acorn selection help assure success in seeding of oaks. The Central States Station has found that bur oak acorns collected from upland sites germinate at a different time of year than those from bottom lands. And in the Black Hills, erratic success of direct seeding over a 50-year period has been traced to site quality and rainfall cycles.

Forests on Coal-Stripped Lands

More than a decade of research in the midwestern coal fields has shown how to establish young forests successfully on lands stripped for coal. Planting recommendations have been worked out for both hardwoods and softwoods. Over 20 tree species are recommended and conditions are described under which each species should be planted. The potential of successful plantations is illustrated by the fact that in some areas the planted stands are now yielding small products such as fence posts, poles, pulpwood, and Christmas trees.

Timber-Wildlife Problems

The increased value of timber products, intensified forest management, and accelerated tree planting throughout the Nation have made it increasingly important to protect young timber from losses of any kind. A significant source of damage in some sections of the country is the wildlife of the forest. Forestry practices can do much to provide more acceptable food and better cover for deer and other game animals. However, studies and observations made in the Northeast and in the West have demonstrated that maximum timber production and maximum wildlife populations, especially of deer, may be incompatible. When deer populations are high, browsing seriously reduces desirable reproduction of valuable species such as black cherry, Atlantic white-cedar, and Douglas-fir. Overbrowsing also nullifies the effects of timber management practices that would otherwise insure good natural reproduction.

The solution to this multiple use management conflict lies in maintaining a wildlife population in balance with natural food supplies, and in increasing the food supply with appropriate forestry practices whenever possible. To learn more of the underlying biological interrelationships and to find solutions to problems such as those just mentioned, research in the field of animal damage and wildlife-timber relations was strengthened in several regions during 1959.

FOREST INSECTS

Biological Control

Further progress was made on the most promising method so far developed of preventing or reducing insect losses. This is *biological control*, which makes use of the natural enemies of insects to reduce populations. A few examples of advances made illustrate the potentials of this approach.

A Forest Service entomologist spent 6 months in Japan searching for insect predators of the balsam woolly aphid which might be introduced and liberated in aphid-infected stands of fir in this country. A few promising species of predators were found and small collections of some were made and shipped to the United States. These are now being studied for possible use and application to control of the aphid.

Parasitic nematodes have been found infesting many species of destructive bark beetles. In Idaho, as many as 90 percent of Douglas-fir beetles examined were infested. In the Southwest, some 40 percent of Ips engraver beetles examined also

were infested. So far, the full effect of these nematodes on their bark beetle hosts is not fully understood. It has been determined, however, that the egg-laying capacities of heavily infested female beetles may be reduced as much as 40 to 50 percent.

Prospects for more effective biological control of the European pine shoot moth in the Lake States appear brighter as a result of the recent discovery in Michigan of a species of foreign parasite which has been released in nearby sections of Canada during the past few years. Observations indicate that the parasite is spreading slowly across Michigan.

New Weapon Effective

For many insects, chemical control remains the most certain means of slowing up the depredations of heavy epidemics. New chemicals and formulations are being studied on a selective basis in many parts of the country. For example, recent experiments have shown that losses caused to lodgepole pine by the lodgepole needle miner can be effectively reduced through the aerial application of malathion spray.

Low Temperatures Stop Pine Beetles

During the winter of 1958–59, low temperatures killed 95 to 100 percent of all stages except the egg of the southern pine beetle in the southern Appalachians. In contrast, these temperatures killed only about 40 percent of the insect predators of the beetle.

Controlling Old House Borer

Recent studies indicate that this destructive insect pest of wood used in houses can be controlled or prevented from infesting lumber through the application of insecticides containing any one of the following: 0.25 percent dieldrin; 0.50 percent lindane; 2.0 chlordane; or 5.0 percent DDT.

FOREST DISEASES

Root Rots on Increase

As our plantations and natural second-growth stands approach the age of first thinning or intermediate cuttings, there is increasing evidence of root rot damage among coniferous species. Of the several fungi commonly invading the roots, two are especially damaging.

Fomes annosus attacks a number of important conifers throughout the United States. Of particular concern at present is the damage this disease is inflicting upon red, white, and slash pine forests east of the Mississippi. Experiments underway to improve controls for this disease already indicate that the European stump creosoting treatment has good promise under conditions here. This treatment prevents the freshly cut stump from serving as a point of entry for the establishment of new infection centers. The possibility of control by modifying standard planting and thinning practices suggested by European experience is also being studied.

Poria weirii, a fungus enemy of Douglas-fir, continues to be a major problem in the management of this species in the West. Reestablishment of stands either naturally or by planting may be prevented by root invasions of this fungus, which can survive for as long as 50 years in infected roots and stumps left after harvesting the original stand. Research results again point to indirect control as the most promising answer in high hazard areas. Planting may be economically impractical, and reliance have to be placed on such reproduction as will naturally become established and survive. Less susceptible species such as western hemlock could be favored in subsequent stand improvement operations.

Nursery Diseases Curbed

Production of two billion forest tree seedlings in 1959 was not accomplished without meeting and overcoming serious disease control problems of two general types.

Mortality in seed and transplant beds is caused by soil organisms, adverse physical conditions, nutrient deficiencies, and other factors. Research has shown that chemical treatment of the soil, along with recommended improvements in general nursery practices, can eliminate a high proportion of such losses. Corrective treatments, which must be prescribed specifically for each nursery, are not unduly expensive, may double or even triple production, and result in sturdier planting stock. Some so-called planting failures in the past have resulted from the use of planting stock already lethally infected at the nursery. In the South alone an estimated 48,000,000 seedlings were discarded at nurseries this year to prevent just such delayed losses. A wide range of fungicidal chemicals is now under trial to control these diseases. Some of these are effective protectants; others show promise not only of protecting the seedlings in the nursery bed and insuring their freedom from disease when transplanted, but perhaps even imparting a degree of resistance to new infections for a period after outplanting.

FOREST FIRE RESEARCH

Heavy losses from forest fires in 1959, particularly in the West, again emphasized an unsolved basic problem in protection from fire. Under critical burning conditions, the best available forest firefighting methods, facilities, and organizations, even though intensively developed and efficiently employed, cannot cope successfully with intense, fast-moving fires. The solution to this problem cannot be found in any single area of research. Rather it requires a concerted effort on a broad front, with emphasis in key areas where

gaps in knowledge make it impossible to prevent or correct conditions contributing to such fires. Continuous research, both basic and applied, is underway to fill in these missing links in the battle against wildfire.

Slash Burning in Douglas-Fir

The debris left after logging in the Douglas-fir region of the Northwest amounts to hundreds of tons per acre. The present policy on the national forests is to burn this accumulation to reduce fire hazard, and to make available more ground space for another tree crop. Observation of results on burned and unburned study plots has shown that after several years there is little residual effect on natural restocking, but that fire control is facilitated for at least 5 to 7 years. Late fall is the favored time to burn, but this can be done safely and effectively only on a few days each year. How to identify these "safe" days is a critical problem, especially in view of the fact that 50,000 acres of national-forest land are scheduled for slash burning each year. A recent study has shown that these days can be identified with reasonable certainty by comparing litter moisture conditions in cut and adjacent uncut areas.

Prescribed Burning in Ponderosa Pine

Controlled burning is frequently advocated for western forests as an economical way to protect timber values, as well as to improve timber and forage production and to conserve water. Attempts to adapt fire to these uses dating back more than 40 years have generally shown that use of fire alone will seldom accomplish these objectives. A cooperative survey has been made with the Bureau of Indian Affairs to appraise the results of a recent program of prescribed burning on 30,000 acres of agency lands. The objective was to cut down wildfire losses and to thin out overly dense young growth of ponderosa pine stands.

Results of the study illustrate the nonselective nature of the effects of fire without complete control over its behavior. Under the conditions existing, fire failed to thin young pine thickets but killed open-grown young trees. Its effects in reducing fuels were also erratic. Above a certain degree of intensity, so much new fire-killed fuel was created that no net reduction in hazardous fuels was achieved. The conclusions from this experiment again confirm the need for more basic information on fire behavior and the factors which influence it.

WATERSHED MANAGEMENT

Logging Increases Snowpack

A number of studies in the West have illustrated that dense stands of coniferous forests have great effect in intercepting snow. Comparisons made between cut and uncut stands show from 10 to 35 percent of the precipitation caught in the tree crowns and evaporated. By reducing interception, logging in mixed ponderosa pine-Douglas-fir stands on north exposures in Colorado caused an increase in the depth of the snowpack. Removal of 60 percent of the stand increased snow accumulation by 4 percent, while a heavy cut taking all merchantable material down to 10 inches d.b.h. resulted in a 28-percent increase. Both intensities of logging increased the rate of snowmelt, so that the snow disappeared from all areas at very nearly the same time.

Runoff and Erosion Reduced

Three small experimental watersheds planted 20 years ago to loblolly pine have yielded a remarkably small amount of surface runoff and soil erosion. During a 12-month period the runoff from the pine watershed averaged only 2.4 percent of the precipitation, in contrast to 9.9 percent from land in depleted hardwoods, and 14.5 percent from old-field watersheds. Average sediment yields for the year were 62 pounds per acre from the loblolly plantations, 627 pounds from the depleted hardwoods, and 731 pounds per acre from the old fields. Recorded precipitation ranged from 52.9 to 56.5 inches for the year on the different watersheds.

COOPERATION IN FOREIGN FORESTRY

The demands upon the Forest Service for advice and technical services in connection with both the bilateral and international-organization programs of assistance to underdeveloped countries continued to grow. Under contractual arrangements with the International Cooperation Administration, the Forest Service carries on selected forestry programs and provides technical backstopping services for that agency. It conducts training of foreign nationals in the United States and Puerto Rico, including an annual Short Course in Tropical Forestry in Puerto Rico.

During the year, 197 study programs were prepared for forestry participants from 48 countries. Of these foreign visitors, 125 were ICA-sponsored; 37 were sponsored by the United Nations Food and Agriculture Organization and other international organizations; and 35 were sponsored by their own governments, philanthropic agencies, or came at their own expense. A wide variety of training was provided. Sixty-four participants received training in general forestry, 51 in forest products, 40 in watershed management and related fields, 17 in forest administration, 16 in range management, and 9 in forest engineering. There was an increase in number of foreign visitors given academic training in forestry in the United States. In such cases, the Forest Service recommended a professional forestry school and arranged for the visitor to receive sup-

plemental field training at Forest Service units during the summer period.

There was an increased demand for Forest Service assistance to ICA in recruiting foresters for overseas technical-assistance assignments, involving 13 different countries. Greater interest in forest-resource survey projects was evident. A forest survey team sent to Cambodia, and three other ICA Missions were assisted in making preparations for forest survey projects. Requests for technical publications and other technical advice and information were received from ICA Missions in many of the 56 countries with which ICA is cooperating. The Forest Service regularly distributed, for ICA, copies of selected current publications to the 25 countries whose ICA Missions have foresters or range-management advisers. Other services performed for ICA included procurement of tree seed and cuttings, forest survey equipment, and other specialized forestry equipment; the revision of an ICA Operation Manual on "A Small Sawmill Enterprise"; assistance in the orientation and briefing of foresters and specialists in related fields before assignment abroad; and refresher training for technicians who have been abroad for 4 or more years.

The Forest Service also cooperated with other agencies of the Government in connection with United States membership in the United Nations and its specialized agencies. These activities covered a wide range of problems in foreign forestry, especially those relating to assistance to underdeveloped countries. Involved were Forest Service representation at a number of international meetings, and serving on technical committees with forestry specialists from other countries.

National Forest Resource Management

In 1959, as in recent years, an expanding population put new pressures on the national forests for more of their renewable resources. The American people received more recreation, better grazing use, more wood and water than ever before from these public lands under multiple use management.

To meet the demands for greater use, the Program for the National Forests was presented to Congress. It set forth long- and short-term goals for intensive management and development that would enable national forests to serve the public at full capacity during the next few decades and on into the future. This program will mean greater production of all the renewable resources to meet greater needs.

All forest resources are important, but none has risen in prominence so quickly as recreation. This use has more than quadrupled during the last 15 years, and has severely strained existing facilities. Operation Outdoors passed the halfway point at the end of 1959; it has done much to meet the demands expected by 1962, but greater efforts are still needed. During the year the Forest Service began the National Forest Recreation Survey, a two-year study that will inventory all recreation resources in anticipation of future demands up to the year 2000.

Timber harvest was up 30 percent over 1958; and national-forest rangelands provided forage for over 3½ million head of livestock. This means more meat, leather, wool, pulp, lumber, and other forest products for America.

The priceless water resource was protected and many acres of eroding and burned-over lands were restored to stable conditions. The extensive network of forest roads, trails, and bridges was maintained and expanded.

In many ways progress on the national forests was encouraging, but a disastrous fire season demonstrated how much can be lost when dry weather and human carelessness combine forces. Protection remains a vital element in sustaining the productivity of national forests.

Multiple use management of national forests involves the coordination of many skills and many resources. The forest must be protected from its enemies—insects, disease, and fire. New trees must be planted and many rangelands rehabilitated. Cutting must be regulated not only to insure a future supply of timber, but to improve the growth of the present forest, to protect wildlife habitat, and to prevent erosion. The various resource uses must be coordinated to serve the greatest number of people and maintain continuous production for future needs.

FOREST RECREATION

Eighty-one and one-half million recreation visits were made to national forests during 1959. This record number is a 19-percent increase over 1958. Visits averaged more than a day each, totaling 95.5 million man-days of use.

People come to the national forests for hunting, fishing, camping, riding, skiing, picnicking, swimming, or just for the quiet enjoyment of the scenery. All of these pursuits are increasing. Recreation visits to the national forests have

tripled since 1950, and it is clear that outdoor recreation has become a valuable national-forest use.

This remarkable growth can be seen by a comparison of figures showing the purpose of national-forest visits:

Primary purpose:	1959	1958	1956	1950
General enjoyment of the forest environment	23, 538, 000	18, 247, 000	14, 190, 000	7, 969, 000
Picnicking	19, 296, 000	16, 127, 000	12, 821, 000	6, 326, 000
Fishing	13, 301, 000	12, 245, 000	9, 499, 000	4, 885, 000
Hunting	6, 838, 000	5, 589, 000	4, 436, 000	2, 285, 000
Camping	5, 681, 000	4, 934, 000	3, 516, 000	1, 534, 000
Winter sports	3, 986, 000	4, 022, 000	2, 673, 000	1, 517, 000
Swimming	2, 520, 000	2, 028, 000	1, 610, 000	902, 000
Hiking and riding	1, 786, 000	1, 613, 000	1, 353, 000	635, 000
Organization camping, canoeing, scientific study, hobbies, wilderness, etc	4, 575, 000	3, 645, 000	2, 458, 000	1, 315, 000
Total	81, 521, 000	68, 450, 000	52, 556, 000	27, 368, 000

Wilderness

A new wild area, the Great Gulf, was established this year in the White Mountain National Forest (Maine and New Hampshire). The Great Gulf Wild Area covers 5,400 rugged acres on the slopes of Mount Washington. This scenic area has long been a favorite of hikers and mountain travelers. There are now 83 Forest Service areas comprising a total of 14 million acres devoted to wilderness recreation.

Earthquake Geological Area

On August 17 and 18, 1959, a severe earthquake shook the region surrounding Hebgen Lake on the Gallatin National Forest. Twenty-eight people lost their lives and many others were injured in this disaster. A huge slide blocked the Madison River and created a 7-mile lake. Faults up to 20 feet in height and other spectacular features remain as evidence of the quake's violence. Despite the tragedy to those killed or injured, the area immediately assumed considerable public interest.

The Forest Service, in recognition of the area's scientific values, has designated it the Madison River Canyon Earthquake Area and will give it special protection under Regulation U–3. Recently completed plans provide for tourist facilities, campgrounds, and information facilities that will serve the many visitors in years to come. Under Forest Service management this area will remain as a center of interest for scientists, students, and tourists.

Operation Outdoors

December 31, 1959, marked the halfway point in Operation Outdoors, part 1. The goal of this 5-year program is to provide sanitation, cleanup, and care at existing recreation areas, and to provide new areas and facilities that will relieve overcrowding and take care of expected increases by 1962. Though started earlier, this project is included in the larger "Program for the National Forests."

Operation Outdoors, in 2½ years, has maintained adequately the existing facilities and areas, and accomplished the following steps toward the 5-year program goals. Of the 40,175 family camp and picnic units scheduled for rehabilitation, work has been completed on 9,000 (22 percent). Of the 40,500 new family camps and picnic units called for in the program, 6,900, or 17 percent, have been constructed. Thirteen winter sports sites have been rehabilitated out of the 120 needing such work. Sixty-two swimming sites have been rehabilitated out of 170 scheduled. Out of 239 swimming sites to be expanded or constructed, 38 have been finished.

These accomplishments mean progress, but public demand for more facilities has increased faster than expected. Financing and installing of new facilities have not kept pace with the demand. Already twice as many people use campgrounds, picnic sites, and other areas as these facilities will safely accommodate. In 1955 a use level of 66 million visits was predicted for the year 1962. The 81 million visits in 1959 topped that figure by 15 million. Revised estimates predict 92 million recreational visits by 1962—39 percent higher than the original estimate. It is clear that Operation Outdoors will not meet its goals unless the program is stepped up considerably or its period extended.

Recreation Survey

Early in 1959 the Forest Service began a detailed two-year study of outdoor recreation resources on its lands: the National Forest Recreation Survey. It will evaluate the national-forest recreation resources and will formulate policies and plans to meet future demands.

Field inventory crews have completed over 50 percent of their work. The progress made thus far indicates that fieldwork will be completed by the target date of September 15, 1960. Fieldwork includes locating, mapping, and making quality evaluations of existing and potential recreation areas. This work aims at finding sufficient land and water resources to accommodate the projected recreation demands.

The results of the inventory will be the basis for detailed recreation plans needed to carry out policies contemplated in the Program for the National Forests.

Increasing Recreation Demand Expected

As a part of the National Forest Recreation Survey, projections of future public recreation demand were made. By 1976, according to these projections, the national forests will be receiving about 230 million visits annually; by the year 2000 the number will have grown to 600 million visits.

Compared with 68.5 million visits in 1958, these projections indicate expansion by 1976 of more than three times the 1958 use, and by 2000 more than nine times present recreation use. The sharp upward trend reflects the combined influence of expected increases in personal income, leisure time, and mobility far more than it does the projected rate of population increase. Six hundred million national-forest recreation visits in the year 2000 would mean the equivalent of 1.81 visits per capita or five times what they were in 1958.

Some changes are expected in the use pattern, due to anticipated highway expansion, new reservoirs, differing rates of population growth, and other factors. Camping and picnicking appear likely to take on added significance—increasing from about 39 percent of total visits in 1958 to 53 percent of projected visits by 2000. On the other hand, there is a projected decline in camping and picnicking outside areas specifically developed for these purposes. Expected to hold to about the same percentage of total visits as in 1958 are such activities as hunting and fishing, swimming, boating, winter sports, hiking and riding, organization camps, hotels and resorts, recreation residences, and wilderness use.

Special Uses

More than 58,000 special-use permits were in effect as of June 30, 1959, for over 3½ million acres of national-forest land. These permits to individuals, companies, and agencies are for more than 100 different kinds of uses, including telephone line rights-of-way, cabins, churches, resorts, schools, winter sports areas, landing fields, and TV, military radar and other electronic sites.

Public uses are free and many types of organizational use are granted for nominal fees. A fee commensurate with the value is charged for commercial use permits and those authorizing private use. Receipts from special-use permits were $1,450,542 in fiscal 1959, compared with $1,211,378 in 1958.

In addition, approximately 2,100 oil, gas, and other mineral leases and permits were in effect on 1,666,540 acres of acquired national-forest land. Receipts from these totaled $1,138,110 compared with $1,045,901 for fiscal year 1958.

Also in effect during fiscal 1959 were 9,515 oil, gas, and other mineral leases on 11,383,883 acres of national-forest land reserved from the public domain. By law, receipts from these leases are credited as other than national-forest revenues. Other uses of national-forest land authorized by the Department of the Interior under the public land laws numbered 9,905 and embraced over 212,000 acres. In effect also on national-forest land during fiscal 1959 were 467 Federal Power Commission permits and licenses involving more than 48,000 acres. The revenues for these uses are not included in the national-forest receipts.

Besides their commercial and utilitarian value, special-use facilities provide for public and private enjoyment of the national forests. Composing an important part of national-forest recreation are the more than 500 resorts, 154 winter sports areas, and 19,000 summer homes. These facilities supplement free recreational use for camping, picnicking, hiking, riding, mountain climbing, and scenic and esthetic enjoyment.

Mining—Surface Rights

Determining surface rights on mining claims under the Multiple Use Mining Act continued ahead of schedule. At the end of 1959, field examination had been completed on 530 areas, totaling 66,318,277 acres. This is approximately 64 percent of the presently approved work to be done. Verified statements have included 14,024 mining claims. This is only approximately 2½ percent of the estimated claims on areas covered.

Surface rights procedure has been completed on 157 areas, totaling 18,155,506 acres, containing an estimated 130,931 mining claims. A total of 1,900 claims were included in verified statements, of which 1,632 claims were withdrawn by the claimant and 23 claims not upheld at hearings before a Bureau of Land Management hearing examiner. For 245 claims the Forest Service stipulated that the asserted surface rights were valid.

A HOME FOR WILDLIFE

The national forests play an important role in providing homes for fish and wildlife. This fact is shown by the variety and quantity of wildlife found on these lands. About one-third of the country's big-game animals, one-fourth of its wild turkeys, and untold millions of small animals and birds—game and nongame—live on national forests. One or more species of big game occur on all of the national forests and most of these forests also support huntable populations of small game animals and upland game birds. The following tabulation shows the occurrence of big game and turkey on the national forests:

	Percent of national forests
Deer	100
Bear	92
Elk	70
Antelope	40
Moose	32
Mountain goats	28
Bighorns	35
Wild boar or peccary	9
Wild turkey	41

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It is estimated that over 20 percent of the people over 12 years of age in the United States fish or hunt; whereas in Europe, less than one percent of the people enjoy these sports. The national forests, always important as public hunting and fishing areas, continue to receive an increasing share of this form of outdoor recreation. Since 1947 hunter and fisherman use of the national forests has expanded 259 percent. This is approximately 6 times the rate of increase in the nationwide sale of hunting and fishing licenses, as tabulated below.

Nationwide license sales:	*1947*	*1958*	*Percent increase*
Hunting	12, 067, 000	14, 764, 000	22
Fishing	12, 620, 000	20, 178, 000	60
Total	24, 687, 000	34, 942, 000	42
Sportsman visits to national forests:			
Hunters	1, 498, 000	5, 595, 000	245
Fishermen	3, 446, 000	12, 147, 000	219
Total	4, 944, 000	17, 742, 000	259

Hunters harvested 589,000 big-game animals and 7,000 turkeys from the national forests in fiscal 1959. This is 33 percent of the total number of big game and 11 percent of the total number of turkeys bagged in this country. In addition, an untold number of fish and small game are harvested on the national forests each year.

Cooperation With States

The Forest Service is charged with the responsibility of managing fish and wildlife habitat on the national forests; the States are legally responsible for the management and protection of wild animals. Thus, joint State-Forest Service action is the key to effective wildlife management on national-forest land.

The Forest Service has continued to encourage the States and other organizations to engage in cooperative direct habitat improvement work of the national forests. In fiscal 1959, the States and the Forest Service improved by direct means the fish and wildlife habitat on 69,450 acres of national-forest land and 92 miles of fishing streams, and constructed 199 small water developments and 102 wildlife study enclosures. In addition, they jointly maintained many existing habitat improvements.

The Statewide cooperative agreements with Montana, Arizona, and New Mexico were completely revised during fiscal 1959.

Coordination With Other Resources

Technical direction of wildlife habitat coordination and cooperative wildlife management work was intensified. Three regions added fishery management biologists to their regional office staffs. All of the 10 regions now have two or more full-time wildlife or fishery management specialists. This has resulted in a stepped-up training program, improved integration of wildlife habitat management with other resources, and more Forest Service participation in State wildlife management activities on national-forest land. Wildlife staff specialists have also taken part in the investigation and preparation of major impact surveys on Federal Power Commission, Bureau of Reclamation, and Corps of Engineers water impoundment projects.

However, still more forest wildlife staff specialists, ranger district aids, and project funds are needed to provide (1) effective integration of wildlife habitat management with other resource uses, (2) acceleration of game range analysis and habitat improvement planning, (3) intensified training of all Forest Service field personnel in wildlife habitat needs and techniques, and (4) increased Forest Service supervision and participation in State wildlife management and habitat improvement activities on national-forest land.

WATER, A PRICELESS RESOURCE

Water is perhaps the most valuable resource that comes from our national forests. A growing population, intensified land use, and expanding industry demonstrate more and more each year the vital necessity of protecting and managing this resource. Since the western national forests in particular cover some of the best, and in some areas the only water-producing lands, the Forest Service makes every effort to protect, improve, and increase the water supply for the country's needs.

Rehabilitation Needs

National-forest lands generally offer excellent protection for watersheds, but they also include areas where extreme abuse in the past or recent forest fires have left the soil without protective cover. Watershed rehabilitation is needed in many such areas because soil stabilization is slow and erosion prevents or greatly retards the reestablishment of vegetation. Without intensive treatment barren and eroded lands will not produce constant supplies of pure water; instead, they will continue to carry silt into streams and reservoirs and will remain as potential flood sources.

Watershed Improvements

Work specifically aimed at improving watersheds and restoring eroding lands covered projects located on 80 national forests. These projects demonstrate that flood threats can be reduced, water tables raised, and erosion checked—in short, the land is returned to productive usefulness under multiple use management.

In California on the Plumas National Forest, the Last Chance erosion control project, a cooperative endeavor, is receiving considerable favorable comment from recreationists, stockmen, irrigationists, and others interested in watershed restoration. Reconstruction of old Civilian Conservation Corps dams and installation of new structures have stabilized channels, stopped erosion, and raised the water table. Forage in the meadow has benefited, and ponds created by the dams now provide excellent trout fishing. On the Sequoia National Forest heavily cutover lands, acquired by exchange, typify how certain soils can erode. Rehabilitation has been accomplished in this area by treatment of old skid trails and truck roads to stop erosion, and to eliminate temporary stream crossings from old logging roads.

On the Oakmulgee Ranger District in Alabama, annual reinforcement and maintenance were carried out on a series of gullied areas. This work consisted of fertilizing, placing small obstructions of earth, rock, or brush to trap sediment, seeding bare spots, and planting trees and other vegetation as needed to promote soil stabilization. As a result of this work which has been underway for several seasons, there has been a marked reduction in floodwater runoff, soil movement, and sediment contribution to stream channels.

In Wyoming, restoration work continued on critical flood source areas on the North Fork of Swift Creek watershed, Bridger National Forest. The town of Afton, located on its banks, depends on Swift Creek for water, and the surrounding area needs its water for irrigation. Two hydroelectric plants are located on the stream. Heavy grazing in years past has so depleted the watershed that summer rains have carried sediment downstream, causing widespread damage, especially to the town's water distribution system, even to plumbing fixtures in homes. Water has become unfit for human consumption on these occasions. The entire watershed was closed to grazing in 1950 with the full cooperation of the local people. Since then the vegetal cover has improved considerably, but some areas were so badly depleted that more work was needed. This restoration work included contour trenches, gully plugs, and seeding necessary to prevent flash floods.

On the Willamette National Forest in Oregon, watershed management included the removal of accumulated flood debris from the channel of Salt Creek during periods of low waterflow. The debris was gradually changing and damaging the stream channel so as to threaten a downstream village, State highway, public utilities, and both private and public lands.

Municipal Watershed Treatment

The Forest Service cooperated with the City of Ashland, Oreg., the Soil Conservation Service, and the Bureau of Land Management to carry out emergency watershed treatment on several hundred acres of the municipal supply watershed in the Rogue River National Forest. As a result of a fire in August 1959 city installations were in danger from floods, debris, and sediment damage during the fall and winter rains. Treatment included aerial seeding of grass cover to bind denuded soil on 600 acres, 40 miles of contour furrowing to reduce runoff and erosion, 200 checkdams to trap sediment and slow down runoff, and the clearing of floatable debris from stream channels. The work of this project has already withstood one severe storm, preventing considerable damage downstream.

Resource Management and Streamflow

The Forest Service is devoting more attention to the effect of land management practices on streamflow in the national forests. It is cooperating with the State of Arizona, the Arizona Water Resources Committee, and others in a large pilot scale study on the Salt River watershed. This project is concerned principally with ways of inducing greater water yields by manipulating range and timber resources. Stream and precipitation gages have been established in 14 small watersheds. After a period of calibration these areas will be subjected to various vegetative treatments to determine the effect on water production and upon resources. Elsewhere in the watershed, thinning of timber stands has been done on 5,900 acres, juniper removed from 5,200 acres, and grass seeded for forage on 8,600 acres, including the area from which juniper was removed. The Forest Service and the Arizona Game and Fish Department are studying and evaluating the effects of watershed treatment measures on forage, wildlife habitat, and food supply.

Similar administrative studies on smaller scale have been started recently in Nevada, Utah, and Idaho. These will study the effects of normal land uses such as logging and grazing on streamflow and sedimentation.

Soil-Vegetation Surveys

The pilot area phase of the national-forest soils program has expanded rapidly since it began in 1957. All regions except Alaska are now staffed with soils men and have pilot area surveys in progress. Seventeen pilot areas have been started. Soil survey field work is complete and soil management reports written for six projects totaling over 900,000 acres. One technical report (Soil Survey Bulletin) has been written. In addition to the resource information being obtained in the pilot survey program, rangers and other fieldmen

in the vicinity of the projects are getting valuable training in soils as they work with soil specialists in preparing multiple use management plans from the field data.

Soil surveys and analyses serve two principal functions: (1) they provide a general indication of the relative suitability of a given area for the production of timber, forage, water, wildlife, and recreation; (2) they serve as a valuable guide to the establishment of criteria for the management of an area for particular uses. Both functions, along with other factors, are given full consideration in multiple use resource management decisions.

THE TIMBER CROP

Improved inventories and management plans, a record volume of timber sales, and expanded tree planting operations are some of the factors in 1959 pointing toward more intensive management of the national-forest timber resources. Through intensified forestry the Forest Service aims to develop the sustained yield capacity so that an allowable cut of about twice that of today may be harvested. Such management will mean not only the fullest use of all forest resources, but also it will add new jobs to forest-dependent industries.

Timber Cut and Sold

National-forest timber cut in fiscal 1959 totaled 8.3 billion board feet—about 30 percent more than in 1958. Cash receipts from timber came to $115,809,000, some $29.5 million over receipts for 1958.

A record volume of 9.4 billion board feet of national-forest timber was sold during fiscal 1959, exclusive of 6 million cords of pulp timber awarded in a sale in Arizona. This shows an increase in sales of 1.1 billion board feet over the previous year. Actual cutting lags about a year behind sale of timber.

New Industries From Timber Sales

A new industry will come to Arizona as a result of the largest timber sale ever made in the 48 contiguous States. The 6 million cords of pulp timber will supply a new paper mill having a daily capacity of 150 tons of kraft paper or board and 210 tons of newsprint. The sale will also result in intensified forestry since the timber will consist entirely of small or low quality trees to be thinned or salvaged from the forests. The timber will come from the Colorado Plateau of Arizona and New Mexico in the Kaibab, Coconino, Sitgreaves, Apache, Tonto, and Cibola National Forests. The contract provides for reforestation, stand improvement, fire protection, and protection of streams and scenic and recreational areas.

Late in 1959 pulp production began at a new plant in Sitka, Alaska. The plant was built in connection with a sale in 1956 of 5¼ billion board feet of timber on the North Tongass National Forest.

Inventories and Management Plans

Modern scientifically designed timber inventories have been made of about three-fourths of the more than 400 national-forest working circles. These inventories, together with accompanying maps, give information on forest types and the volume, location, and growth of timber. Inventory data are used in calculating allowable annual cut and in preparing sustained-yield, multiple-use timber management plans.

A timber management plan is prepared for each working circle, or, sometimes, a group of working circles. This plan establishes long-term sustained-yield goals and sets up a short-term program of management to achieve those goals. It provides working guides for the coordination of timber harvesting with road construction, recreation use, the production of water, forage, wildlife, and other multiple uses of the national forests.

The length of rotation, i.e., the time required to grow a timber crop to maturity, is an important decision in a timber management plan. Rotations are based on the production of the greatest volume of high quality timber possible under multiple use of the lands included in the working circle. For nearly all forest types and sites, this means an objective of producing continuous crops of sawtimber of good size and quality. Other forest products, such as pulpwood and posts, are harvested as thinnings or improvement cuts and from forest types and sites which do not grow to sawtimber size.

Inventory data are used in calculating what the allowable cut is to be. The decision is based on many factors, including rotation, volume of timber, condition of timber, and growth rates. Allowable cut is expressed in board feet, but usually is divided into (1) timber of sawtimber size and (2) timber under sawtimber size. The present total allowable cut for the national forests is 10.6 billion board feet (9.2 sawtimber plus 1.4 smaller material). Ultimate sustained yield capacity is about twice the present allowable cut and long-range plans call for harvesting the full amount by the year 2000.

At about 10-year intervals working circles are reinventoried, allowable cuts are recalculated, and management plans are revised. Thus current data keep timber management geared to advances in forestry and up-to-date market demands.

Reforestation and Stand Improvement

Tree planting and seeding and timber stand improvement during fiscal 1959 compared favorably with the 1958 accomplishments. The 13 Forest Service nurseries supplied 123 million seed-

lings and transplants for field planting. Four nurseries were expanded and one new nursery was put in production. Land was acquired for an additional nursery, which will make a total of 14 operated by the Forest Service.

The following table summarizes major accomplishments in fiscal 1959:

	Treated acreage		
Kind of treatment:	*Financed from appropriated funds*	*Financed by collections from purchasers*	*Total*
Planted and seeded	38, 707	73, 375	112, 082
Natural regeneration measures	23, 222	27, 294	50, 516
Plantation release	38, 545	18, 242	56, 787
Weeding, thinning, cull tree treatment	55, 425	430, 116	485, 541
Pruning and crop tree release	982	116, 792	117, 774
Animal control (mostly fencing)	52, 519	135, 063	187, 582
Rodent control (including porcupine)	556, 321	40, 083	596, 404
Sanitation cutting	25, 769	36, 276	62, 045

Acreage planted and seeded exceeded that for 1958 by 23,097 acres. Work on 12,224 acres of the increase was accomplished with appropriated funds, and the remainder with funds collected from timber purchasers. Additional cultural measures other than rodent control were applied to 964,000 acres.

NATIONAL-FOREST RANGELANDS

The national forests of the West continue to play a significant role in meeting the Nation's demands for meat. In 1959, 1,295,264 cattle, horses, and swine and 2,624,346 sheep and goats grazed on the 60 million acres of national-forest rangelands and an additional 4 million acres of land-utilization projects administered by the Forest Service. In terms of total U.S. beef cattle and sheep populations, the numbers grazed on the national-forest lands appear small, yet the forage from these and land-utilization ranges constitutes an essential part of the year-round grazing cycle for about 21,000 holders of grazing permits. They depend upon this forage to sustain their stock during periods when home ranges do not provide sufficient forage or feed.

For fiscal 1959, income from grazing fees totaled $4,485,706, an increase of 21 percent over the previous year's figure of $3,711,245. The national forests provided $3,750,916 and the land utilization project lands the remaining $734,790.

Range Improvements

Passing the one-million-acre mark in range rehabilitation by seeding and controlling undesirable plants was a remarkable accomplishment. With 149,114 acres rehabilitated in 1959, the cumulative total reached 1,122,842 acres. The 1959 range rehabilitation was largely accomplished throughout the western range States.

Use of helicopters showed considerable promise for economical chemical control of big sagebush and wyethia. Tests of ground spray equipment, to be used where aerial spraying has not proved successful, continued and improvements on a tractor-mounted slip-on spray unit were developed.

Better control and distribution of livestock was fostered by installation of 531 miles of fence, 536 water developments, and 26 miles of stock driveways. With the 1959 work the national-forest lands now have 31,100 miles of fences, 2,900 miles of stock driveways, and 20,000 stock water developments. Of the $1,702,000 spent in 1959 for improvements including revegetation, $684,000 or 40 percent was financed by permittees.

Allotment Analysis

Work proceeded toward the Forest Service's 1966 goal to complete initial analysis and develop improved management plans for each of over 11,000 grazing allotments. By the end of fiscal 1959, the initial analysis and planning task was about 30 percent complete with analyses done and plans in operation on over 1,500 allotments and work in progress on many others. Two interregional meetings and training sessions in allotment analysis within each of the western regions were held.

National Forest Protection and Development

NATIONAL-FOREST FIRE CONTROL

Extreme fire conditions in California accented the disastrous and costly 1959 fire season on the national forests. A severe drought in the Pacific Southwest and critical burning conditions in other Western States made fire suppression extremely difficult. Fires were numerous and spread rapidly in all kinds of fuels. Especially large losses occurred in timbered areas of Arizona, California, and Oregon. As a result of these conditions the Forest Service had the largest firefighting bill in its history. Fire conditions were normal east of the Rocky Mountains except in the Black Hills National Forest in South Dakota. In all western areas the fire season was worse than average.

Number of Fires and Area Burned

The 9,635 fires in 1959 were slightly below the average number. Lightning fire occurrence was 8 percent below the 5-year average. While man-caused fires nationwide increased only 4 percent over the average, the three western regions had

40 to 50 percent more such fires than normal. This increase is attributed largely to an early drought that brought severe burning conditions to this area 2 to 3 months earlier than normal. Area burned this year was 288,606 acres as against 116,453 acres in 1958 and the 5-year average of 211,300 acres.

Use of Aircraft

Aircraft were used more for firefighting in 1959 than in any previous year. Fixed-wing aircraft flew 26,030 hours and helicopters 6,716 hours compared with 22,923 hours and 4,106 hours, respectively, in 1958. They carried 35,723 passengers and 1,297,247 pounds of cargo. Commercial and privately owned aircraft accounted for 82 percent of the total hours flown.

Helicopters have now become an invaluable part of the fire control work, particularly in rough and inaccessible areas. Long hikes wear out firefighters before they reach some of the fires; now helicopters when they are available get men and equipment to the fires quickly—before the fires become larger and get completely out of control. In initial attack men can be taken directly to fires, or moved rapidly from one fire to another in a fraction of the time required by other transportation means. Besides being one of the quickest means of transportation, helicopters have many other capabilities; they can be used to lay firehose over steep and rugged terrain, drop liquid fire retardant on hot spots with pinpoint accuracy, detect fires, and make low-elevation aerial reconnaissance of going fires.

Fire Retardant Use Growing

The use of aerially dropped chemical fire retardants was introduced as a new method of fighting forest fires in 1956 when 123,700 gallons were cascaded on fires. Since then this method has been applied on an ever-widening scale. In 1959, 3,360,000 gallons were dropped on 507 fires, compared with 1,560,000 gallons on 322 fires in 1958. In 1959, a special initial action program of air attack was established in southern California; in the four-forest area covered by the program 1,200 gallons of retardant can be placed on any fire within 30 minutes of detection.

Equipment Development

Development and testing of fire control equipment progressed in 1959. This work included: protective clothing and equipment for firefighters, more efficient and safe air tankers for applying chemicals, better retardant-mixing apparatus, and equipment for ground application of retardants. Prospects for developing an aerial bomb to apply retardants were further explored. In 1960 simplified electronic equipment will go into use that automatically measures, transmits, receives, and records fire weather data.

Lives Lost Fighting Fires

Fourteen men died fighting forest fires or on work related to fire control in 1959. In California five men were burned to death on one fire, one died from burns suffered from another fire, one was fatally injured when accidentally struck by a plane load of fire retardant, one died from pneumonia caused by smoke inhalation, one from a heart attack, and one as a result of a truck accident. In Idaho three men died from injuries rereived in an airplane landing accident. In Utah one man was killed when struck by a helicopter rotor blade.

Training and Safety

At all operating levels more time was spent and greater emphasis placed on fire safety and training in fire behavior. Two new training films were produced: "Prescribed Burning in the South" and "Fire Equipment Plows." Five more films are scheduled for completion in 1960: "Introduction to Fire Behavior," "Slash Disposal," "Air Tanker Attack," "Use of Helicopters in Fire Control" and "Safe Practices in Fire Control."

Rural Fire Defense

The Forest Service is responsible for planning a national program that will prevent and control fires caused by enemy attack in rural areas of the United States. It directs Federal activities and provides technical guidance to the States. Plans have been prepared in cooperation with State and other Federal agencies providing for coordination between all forest fire control agencies and urban firefighting units.

The Department of Agriculture's civil defense responsibility includes the establishment by the Forest Service of 130 fixed radiological monitoring stations on national forests throughout the country. During the year the monitoring instruments were distributed to these stations, and many instructors and monitors were trained.

ENGINEERING

Management, protection, and use of national-forest resources calls for many engineering skills. There must be roads, trails, and bridges to get the timber out and to get the hunters, fishermen, and campers in. New administrative buildings must be constructed and many types of equipment installed and maintained. Boundary survey, aerial photography, and mapping are interdependent engineering jobs that help improve national-forest management and administration. Engineering is a basic tool in the sound multiple use management of national forests.

Boundary Survey and Marking

A major program is underway to define the boundaries of national forest and private land lying within the exterior boundaries of national forests. This involves the location of some 800,000 property corners and the marking of 156,000 miles of boundary line. Thanks to the intensive groundwork done in 1958 when the program got underway, the accomplishments for 1959 show considerable progress: 11,000 corners were evaluated, 3,100 of the evaluated corners were monumented, and 350 miles of boundary and land lines were surveyed or retraced.

In 1959, the regional offices trained 470 Forest Service personnel for work in this program at 52 training sessions. Some 780,000 corners remain to be evaluated and monumented, and over 155,000 miles of line still need to be resurveyed or retraced and posted.

Forest Transportation System

As of June 30, 1959, the transportation system used for protecting and utilizing the national forests consisted of approximately 153,300 miles of roads, 108,320 miles of supplemental foot and horse trails, and 200 landing fields for fixed-wing aircraft. This system is maintained in part by the Government, and in part by State and local authorities, private cooperators and permittees, and timber purchasers.

The following tabulation shows how the roads and trails in the system were maintained in fiscal year 1959:

	Estimated mileage	
	Roads	*Trails*
Maintained for traffic or cared for and preserved by the Government	93,616	104,985
Maintained for traffic by others	59,728	3,335
Total	153,344	108,320

In fiscal 1959, the funds obligated for maintenance, preservation, construction, and reconstruction of forest roads and trails totaled $36,300,000. In addition, Federal timber purchasers performed work in construction and reconstruction of roads with an estimated value of $39,600,000.

The construction and reconstruction accomplished on the national-forest transportation system in fiscal 1959 were as follows:

	Units of work completed	
	By the Government	*By Federal timber purchasers*
Roads (miles)	1,221.0	3,506
Trails (miles)	229.0	-----
Bridges (number)	421	35

Cartography (Mapping)

Maps are a basic need for objective forest management. Map coverage needed by the Forest Service amounts to an area of 725,615 square miles. This includes the lands within the national forests and adjacent areas where roads, trails, and drainage directly influence national-forest protection and administration.

There is still a shortage of adequate maps, but new methods and new equipment are helping to cut down the backlog of mapping needs. At the end of 1959, planimetric mapping, as a preliminary to standard topographic maps, had been completed on 57 percent of the area needing map coverage.

In 1959 the Service produced planimetric maps of 70,000 square miles; 29,000 square miles of topographic maps were produced by other agencies for the area of Forest Service interest. Although the Service depends primarily on the U.S. Geological Survey for its topographic mapping, the Forest Service contributed such maps of 800 square miles to the year's total.

Aerial Photography

The use of aerial photography for mapping and for forest resource planning and utilization has grown tremendously in recent years. The economies permitted by the efficient use of aerial photographs outweigh the initial costs of securing photographs.

During fiscal 1959 the Forest Service took steps toward obtaining coverage of 56,086 square miles for timber management and mapping, and an additional 5,639 lineal miles of strip photography. The strip photography will be primarily for the first forest survey of interior Alaska.

Buildings

A sizable program of building construction is necessary for the progressive development of the national forests. In the execution of this program during fiscal 1959, the Forest Service designed, planned, and supervised the construction of 233 housing units, 33 lookouts, 144 other types of buildings and garages, and 8 research laboratories. In some special cases, such as research laboratories, supplementary contract engineering and architectural services were employed; in these cases the Forest Service retains technical direction and inspection responsibility.

Waterpower Developments

An important limitation to the maximum development of the national forests is the withdrawal from "entry, location, or other disposal" of 2,813,000 acres of national-forest land by action of the U.S. Geological Survey or the Federal Power Commission. The object of these withdrawals is to protect the hydroelectric power values of potential sites for reservoirs, dams, powerhouses, canals, and transmission line rights-of-way.

Since the 307 existing Federal Power Commission-licensed power projects occupy only about 159,000 acres of these withdrawn lands, a large amount of national-forest acreage is encumbered with reservations for power use, which may or

may not be justifiable under present social and economic conditions. Administration of these lands is limited because construction of roads and other improvements must not injure potential hydroelectric power values. Many of these withdrawals date from the early 1900's when evaluation of the power sites was made with little consideration of the effect on timber and recreation values.

In an effort to clarify the status of these lands the Forest Service is collaborating closely with the U.S. Geological Survey in its program for river basin review of the withdrawals.

LANDS

As of June 30, 1959, the Forest Service administered some 185.6 million acres of publicly owned lands. About 181 million acres were administered for national-forest purposes, including experimental forests and ranges, and 4.6 acres were in land utilization projects administered for land and resource conservation pursuant to Title III of the Bankhead-Jones Farm Tenant Act.

Almost one-fifth of the land within the units of the national-forest system is privately owned or owned by States, counties, or other Governmental agencies. Private and other non-Federal lands also are intermingled with the land utilization project lands. This mixed ownership pattern in many areas complicates land and resource management. Desirable adjustments in land ownership are accomplished through continuing programs of land exchange, purchase, and transfer.

Changes in the areas of lands administered by the Forest Service in fiscal 1959 are as follows:

	Acres
Increases:	
(1) Purchased	11,942
(2) Conveyed to the United States in exchange	86,112
(3) Donated to the United States	134
(4) Transferred from other Federal agencies	22,583
(5) Reserved from public domain	2,449
(6) Recomputations, adjustments, miscellaneous	1,933
Total	125,153
Reductions:	
(1) Conveyed by the United States in exchange	60,420
(2) Grants, sales, reconveyances, mining patents, homesteads, etc	2,965
(3) Transferred to other Federal agencies	4,599
(4) Eliminated from national forest and returned to public domain status	10
(5) Recomputations, adjustments, miscellaneous	1,997
Total	69,991
Areas administered as of June 30, 1959	185,654,590

NATIONAL FOREST LANDS

Exchanges and Purchases

During fiscal 1959, 88 exchange transactions were approved, authorizing the exchange of 42,067 acres of national-forest or other lands for 89,616 acres of State, county, or private land within the national-forest boundaries. When these exchanges have been completed, they will help block in national-forest land as well as consolidate non-Federal properties. Studies indicate that about 1.4 million acres of isolated, scattered, or checkerboard national-forest land should be exchanged for land in other ownerships.

Fifty-one tracts containing 6,012 acres were approved for purchase under the Weeks law. Four hundred and six acres in the Boundary Waters Canoe Area, Superior National Forest, Minnesota, were approved for purchase to help consolidate landownership in this wilderness canoe area.

Rights-of-Way

The increasingly intense use of national-forest resources is creating a growing need for rights-of-way to provide access to national forests through lands in other ownerships. Population growth and strong pressures for land use make it urgently necessary to fully open up the national forests and to obtain necessary rights to go across private property. Sometimes the Government and private landowners or timber operators cooperate in building the necessary roads. In other cases public needs can be met by obtaining the right to use existing private roads. Each year the Forest Service initiates between 1,300 and 1,400 individual transactions to obtain rights-of-way over private lands.

New National Forests

Three new national forests were established by Presidential Proclamation in November of 1959 from land utilization projects administered by the Department since the 1930's and by the Forest Service since 1954. The new national forests are: the Oconee in Georgia (96,066 acres), the Tuskegee in Alabama (10,777 acres), and the Tombigbee in Mississippi (65,232 acres). The national-forest system now includes 151 national forests, 21 national-forest purchase units, 11 experimental areas outside of national forests, and 56 land utilization projects.

Modifications

Other actions substantially modified national-forest boundaries during the year. By Executive orders some 130,000 acres of former land utilization projects, which have been administered by the

Department for over 20 years, were included in the Chattahoochee National Forest in Georgia, the Holly Springs National Forest in Mississippi, the Ouachita National Forest in Oklahoma, and the Wasatch National Forest in Utah. Several small tracts of public domain totaling 1,733 acres were added to the Black Hills, Shasta, and Toiyabe National Forests. A public land order pursuant to the Clarke-McNary Act of 1924 added 3,317 acres to the Medicine Bow National Forest in Wyoming; the land had formerly been an internal exclusion in the Pole Mountain division administered by the Department of the Air Force. By Public Law 86–92 about 2,400 acres formerly administered by the Bureau of Reclamation adjoining the Cascade Reservoir in Idaho were transferred to the Boise and Payette National Forests.

The boundaries of 10 national forests in North Carolina, South Carolina, Alabama, Florida, Mississippi, Louisiana, and Oklahoma were modified to exclude some 1,300,000 acres of privately owned land, the purchase of which has proved no longer necessary or feasible, and to include about 68,000 acres previously acquired for national-forest purposes. In the same way the boundaries of the Allegheny National Forest in Pennsylvania and the George Washington and Jefferson National Forests in Virginia were redefined to exclude 159,000 acres of private lands. Certain lands within the boundaries of the Willamette, Mt. Hood, Rogue River, Siuslaw, and Umatilla National Forests in Oregon have been transferred to the jurisdiction of the Department of Interior as a result of the exchange of national-forest and O&C Railroad revested lands with intermingled and other private lands; national-forest boundaries have been adjusted to reflect these transactions.

LAND UTILIZATION PROJECTS

During the years 1934–1942 the Federal Government acquired submarginal or depleted farm, forest, and watershed lands which are called land utilization projects. On these projects good conservation practices have been applied to bring the land back into safe and proper use.

Over half of the total acreage acquired under this program was best suited for inclusion in national forests, national parks, Indian reservations, grazing districts, wildlife management areas, State forests and parks, and research or other conservation projects. Under policies established by the Secretary of Agriculture, necessary transfers, sales, or grants were completed by which these lands were placed under the control of the appropriate agencies.

Management of LU Projects

The 56 land utilization projects are administered under Title III of the Bankhead-Jones Farm Tenant Act, a law that directs the Secretary of Agriculture to develop a program of land conservation and utilization. Most of these projects are located on the Great Plains or in the West in areas best suited for grassland agriculture. Management practices have restored these lands and put them into production of grass or other uses for which the land and area are best suited. Water conservation and soil stabilization measures that have been taken include revegetation, grazing management, and flood source control. These projects demonstrate good land management and grassland agriculture and furnish recreation opportunities, wildlife habitat, forage, water, and minerals.

Projects comprising about 2½ million acres are leased for grazing under short-term agreements to livestock grazing associations, soil conservation districts, and other local agencies. These leases serve to bring together for the lessee the grazing of mixed Federal and private lands; in this way correlated management of the land is possible. Terms of the leases provide for protection and development of the land. Nonleased projects are used by livestock owners under permits. Permits for land use, as well as mineral leases, are handled in almost the same manner as are corresponding permits in the national forests. Concessioners lease intensively developed recreation areas and pay the Government a portion of their gross annual income. Public recreation, including hunting and fishing, is encouraged. On forested areas, merchantable timber is marketed and sold under competitive bid. Utilization of minerals is handled by the Department of the Interior.

Receipts from the land utilization projects for fiscal 1959 are as follows:

Grazing	$734,640
Timber and forest products	346,955
Mineral leases and permits	747,579
Recreation	25,379
Cropping, haying, and seed harvest	38,095
Others	26,588
Total	1,919,236

Counties in which the land utilization projects are located receive 25 percent of receipts from these lands, to be used for schools and roads.

Cooperation—State and Private Forestry

State and private forest landowners are given assistance in the management and protection of their properties through cooperative Federal-State programs authorized by Congress.

These cooperative programs showed marked advancement for the year. Tree planting reached a new high, protection against fire was expanded, and additional help was given to private forest owners in their management and marketing problems. Advances were made in pest control, flood prevention, and rural development work.

TREE PLANTING

Forest and shelterbelt trees planted throughout the country passed the 2 billion mark in fiscal 1959. These were planted on 2,151,743 acres, the average planting being about 1,000 trees per acre. Most of the planting—89 percent—was on privately owned land, one-fourth of which was owned by forest and other industrial organizations.

This was the third year in a row that tree planting had taken a big surge upward. The 2,151,743 acres planted and seeded in fiscal 1959 represented an increase of 583,035 acres over 1958. The 1958 planting showed an increase of 397,718 acres, and the 1957 planting, an increase of 255,562 acres over the previous year.

The 1959 planting surpassed by 37 percent the 1958 record of 1,568,708 acres. It more than tripled the planting reported for 1953.

Southeastern States Far in the Lead

Ten States in the Southeast each planted over 60,000 acres for a total of 1,597,561 acres, or nearly 75 percent of the total for the Nation. Four of these States planted more than 200,000 acres each, with Georgia in the lead at 335,593 acres, followed by Alabama with 214,519 acres, Florida with 204,153 acres, and Louisiana with 200,617 acres. Only two States outside of the Southeast planted more than 60,000 acres in 1959—Oregon 102,630 acres, and Washington 63,049 acres.

Federal agencies planted and seeded 169,167 acres, which is an increase of 23 percent over 1958. About 112,000 acres of this was on national forests and nearly 36,000 acres was on Department of Interior land. State and non-Federal public agencies planted 66,858 acres, which is 10 percent less than in 1958.

The 2,080,100,000 tree seedlings used in the 1959 planting were supplied by 243 nurseries. This compares to an output of 1,554,700,000 seedlings from 240 nurseries in 1958. Nearly 87 percent of the increase in seedling output in 1959 over 1958 came from State forestry agency nurseries, which reported an output of 1,536,694,000 trees from a total of 104 nurseries. These State nurseries were constructed and have been operated over a period of many years through Federal-State cooperation under authority of Section 4 of the Clarke-McNary Act and more recently the Conservation Reserve of the Agricultural Act of 1956.

More Direct Seeding

Of a total 108,766 acres seeded with forest tree seeds in 1959, 98.6 percent was on public and industry holdings. Although the total planting on these classes of land increased by less than 12 percent over 1958, the seeding part of their planting effort increased by more than 33 percent. The use of this method of forestation has been made feasible through the development and use of a chemical application which coats the seeds and repels birds and rodents that might eat them prior to germination. In locations where climate, soil, and species make direct seeding practical this method will speed up forestation work.

Conservation Reserve

A large part—approximately 70 percent—of the nearly 1 million acres planting increase in 1959 over that reported for fiscal 1957 was the result of planting on land withdrawn from crop production under Conservation Reserve program contracts. Under cooperative agreements with the Forest Service, State forestry agencies furnished planting stock or technical assistance, or both, to farmers planting trees under Conservation Reserve.

In fiscal 1959 Conservation Reserve funds enabled States to grow or buy 586,780,000 seedlings for planting. Financial assistance from the Conservation Reserve also made possible the expansion of nursery facilities to produce tree planting stock. Nineteen new nurseries were constructed and 44 old nurseries were expanded during fiscal years 1957, 1958, and 1959. This added capacity can produce more than 700 million young trees annually.

State foresters provided 1,259 man-months of forestry technical assistance to landowners and county committees in the planting of trees. Approximately 64 percent of this service was financed with Conservation Reserve funds allotted to the States.

Tree planting signup under the Conservation Reserve through fiscal year 1959 totals more than 1,822,000 acres. It is estimated that an additional 375,000 to 425,000 acres will be signed up for tree planting in the 1960 Conservation Reserve program. Nearly 8 percent of all land withdrawn from agricultural production under Conservation Reserve contracts is being planted to trees.

Tree Planting Stock

Production, procurement, and distribution of seedling and transplant stock under Section 4 of

the Clarke-McNary Act reached a new record in fiscal 1959—945,464,000 plants. Forty-six States and Puerto Rico cooperated in this program.

The Federal Government paid $658,415 and the States contributed $1,715,259. Receipts from sale of seedlings totaling $4,575,282 were also used to finance the program.

To encourage tree planting, the price of planting stock is kept as low as possible. In 1959 the average selling price was $5.98 per thousand.

COOPERATIVE FIRE CONTROL

Under authorization of the Clarke-McNary Act of 1924, the Forest Service cooperates with the States in protecting State and privately owned forest lands against fire. During the year, 47 States participated in the Cooperative Forest Fire Control program. The three nonparticipants were Arizona, Alaska, and Kansas. It is anticipated that two of these before long will come in under the program. Arizona is conducting a study to determine her needs for a forest fire protective program, and Alaska is making tentative plans to provide protection to the lands which will be under State and private ownership within her boundaries.

In fiscal 1959, the Federal Government contributed $9,401,413 for protection of State and privately owned forest lands against fire. State and private expenditures were $44,983,530 for the same period, or about 82 percent of the total. The total of $54,384,943 exceeds expenditures for the previous year by slightly over $2 million and is accounted for by increased State and private contributions.

Program Review

A review of record keeping in the Cooperative Fire Control program was made jointly by the Association of State Foresters and the Forest Service. This was done in response to a recommendation by the Battelle Memorial Institute, which completed in 1958 a 2-year study of the Cooperative Fire Control Program. The Battelle report stated that more detailed and consistent data related to fire experience and costs are needed as a basis for concise evaluations of the program. The findings of the joint review of the Association of State Foresters and the Forest Service are not yet available for publication.

The Fire Record

Slightly more than 3¼ million acres of State and privately owned forest land were burned over by fire in 1959. This is a near record low, bettered only in 1958 and 1957 when the national burn was 2,991,000 and 3,221,000 acres, respectively. The current downward trend in acreage losses is illustrated by the average for the 5-year period ending 1958, during which 5½ million acres burned annually.

Number of fires occurring on State and private lands during the year totaled 95,727. This is the third consecutive season total annual occurrence has been less than 100,000. Until 1957 the annual number of fires had never been less than 100,000 and too often was significantly higher. For example, just 5 years ago, in 1954, the incidence was 168,000.

Development Needs

Although progress in the last two or three years has been especially gratifying, many goals are not yet attained. Fire caused by man and his carelessness still is the greatest problem in protection of forest lands, and the need for intensified prevention is paramount. There remain 34 million acres of forest land without any organized protection. The 17,925 forest fires on these unprotected lands burned 1,577,440 acres in 1959. Other lands, totaling several times the size of the unprotected acreage, are in need of stepped-up, more adequate protection.

More adequate protection calls for the wider use of newly developed and proven facilities, in addition to a more complete complement of essential personnel, tools, and equipment. Several types of aircraft are now being utilized with striking success in fire protection programs. Fixed-wing airplanes show much promise as airborne tankers from which to drop fire retardants in remote or inaccessible areas. Expanding research findings, not only with this type of aircraft but also with retardants, are encouraging. Helicopters have been found of great value for precision dropping of retardants, reconnaissance, and equipment and manpower transport. More aircraft of both types are needed. Conversion of State radio systems to high band frequencies is necessary to relieve congested low-frequency bands. Constant improvements of specialized surface vehicles such as rough terrain jeep-type automobiles, water transport, and equipment carriers are required additions to fire protection mobile fleets. Similarly, research development in the area of tools and equipment including power pumps, fireline-building machinery, and high-pressure water-using devices require replacement programs to maintain effectiveness in fire protection.

The States fully recognize the need for continuing attention to improvement and development of their efforts. They are adopting improvements and are sponsoring development; however, too many of the States' programs are restricted severely by local limitations. Program expansion is essential to efficient protection from fire of State and privately owned forest lands which, in the aggregate, constitute an area of forest land significantly larger than that of all other fire protection agencies combined.

COOPERATIVE FOREST FIRE PREVENTION

The nationwide Cooperative Forest Fire Prevention Campaign had another good year in 1959. This educational program, aimed at preventing man-caused forest fires, is supported by the Association of State Foresters and the Forest Service and sponsored by The Advertising Council, Inc., as a public service. Smokey Bear, the symbol of forest fire prevention, becomes better known and more popular every year, not only in this country but also internationally.

Southern CFFP Organized

Since more than 50 percent of all man-caused forest fires occur in the 11 Southern States, a special Southern Cooperative Forest Fire Prevention program was started. This program supplements but does not replace the national program. It is financed by the Southern States and the Southern Region of the Forest Service. A new slogan, "Every time a forest fire strikes, you get burned" was adopted by the Southern CFFP. Special materials designed to cope with conditions in the Southern States were produced.

Smokey TV and Radio Broadcasts

During the year, Smokey Bear TV forest fire prevention spots were viewed over two billion times. Radio Smokey Bear announcements were heard 202 million times. The total value of this public service by the Nation's broadcasters was estimated to be $12,939,890.

Three new Smokey Bear-Little Boy animated TV spots were used during the year. These were "Green Thumb," "Space Age" and "Smoke Smeller." In addition a new 4½-minute film "Snuffy" received wide acclaim and was shown at the International Film Fair in Germany.

Series II of "Smokey Visits The Stars" was prepared for radio. This series consists of eighteen 4½-minute programs, each featuring Smokey and a different well-known motion picture star. A radio platter consisting of 1-minute spots extracted from the 4½-minute program in Series II was also prepared.

Ad Council Features Smokey

During October, The Advertising Council Executive Board meeting held in Los Angeles featured the Forest Fire Prevention campaign. The Outdoor Advertising people affiliated with the council displayed in the metropolitan Los Angeles area over 300 outdoor posters containing Smokey and fire prevention messages. This was particularly opportune because at that time the fire danger in southern California was extreme.

Golden Smokey Award

A single Golden Smokey statuette was awarded The Association of Radio and Television Broadcasters of America for their outstanding contribution to forest fire prevention.

Each year 1 to 4 Golden Smokey awards are made to organizations who have made significant contributions to forest fire prevention on a national basis.

Animated Talking Smokey Exhibit

A special exhibit featuring Smokey was designed and built for a 3-months' run at the Oregon Centennial held in 1959 at Portland. The characters, Smokey supported by three of his forest friends and the Little Boy from the TV series by that name, all move and talk. The exhibit was very popular at the centennial and received wide acclaim and publicity. Following the centennial, the exhibit has appeared at the Western Washington Fair, the Northwest Livestock Exposition, and the Washington, D.C., Home Show. The exhibit will be scheduled for other important meetings to be held throughout the country.

FOREST MANAGEMENT

Forty-five States and Puerto Rico participated in the Cooperative Forest Management Act Program in the fiscal year 1959. New Mexico executed an agreement and plan which became effective July 1, 1959. Alaska, Arizona, Wyoming, and Hawaii are the only States not participating in the program.

Congress appropriated $1,522,000 and the cooperating States spent $2,391,120 in carrying out the 1959 program. An increase of $641,564 in State funds over the previous year made 1959 a record year in serving private forest owners. A total of 509 State-employed foresters assisted 76,546 owners with their management and marketing problems on more than 4 million acres of small woodlands. Services given included preparation of plans for timber production and other special products such as naval stores; marking timber for sale; tree planting; protection from fire, grazing, and pests; and increasing wildlife and recreation benefits. Woodland owners and operators were assisted in marketing 660 million board feet of timber products having a gross value of $13,253,516. A total of 7,141 small operators and processors were advised on improved methods of logging and mill layout and operation.

Specialized Assistance

Public and private agencies, forest industries, colleges, universities, and large forest-land owners were given specialized technical forestry assistance. The Forest Service helped conduct or participated in training schools to give State, Federal, industrial, and consulting foresters information on latest techniques of management, utilization, log grading, and continuous forest inventory.

Naval Stores Program

The Forest Service cooperated with the Agricultural Conservation Program Service in the Naval Stores Conservation Program. More than 2,500 gum naval stores producers participated in the program. Although these producers represent only 68 percent of the total number of producers, they worked 26 million faces, or 87 percent of the entire naval stores crop.

RURAL DEVELOPMENT

About 200 counties in all are in Rural Development areas. In 60 percent of these counties over half the area is in commercial forest land. Federal-State cooperative programs provide technical forestry assistance to forest-land owners and processors of primary forest products in about four-fifths of the rural development counties throughout the country.

Forest Service programs reemphasized the importance of forest resources to rural job opportunities and the income level in rural areas of under-employment. Working with State forestry agencies and the Extension Service, the Forest Service assisted State and county committees in planning the full use of their forest resources. The success of this work with the local people and industry is evidenced by the increase in numbers of treating plants, woodyards, wood fabricating and pulp plants, and other wood-using industries either located in or drawing raw material from rural areas.

PEST CONTROL

The Forest Service, in cooperation with State agencies, private landowners, and local protection associations, provides overall leadership and technical advice for the prevention, detection, evaluation, and suppression of forest insect and disease damage on non-Federal lands. It administers all phases of control on the national forests and gives technical assistance to other Federal agencies in their control work. The Federal-State-landowner activities are on a cost-sharing basis.

Diseases

To protect the Nation's white pine timber resource, a total of 23 million acres has been selected for protection from damage by white pine blister rust. This includes 3½ million acres of national-forest land, ½ million acres of land administered by the Department of the Interior, and 19 million acres of non-Federal land. Control has been established on 18,500,000 acres, or 80 percent of this acreage.

In 1959 control activities centered on work to maintain this condition and to establish the same degree of control on the remaining 20 percent of the selected areas. A total of 1,536,932 acres was treated, of which 226,389 acres were Federal land and 1,310,543 acres were non-Federal land. Control activities consisted of systematic examinations to locate and eradicate ribes (gooseberry and currant plants), the alternate hosts of the blister rust fungus. Nearly 13 million ribes plants were located and eradicated. In addition, approximately 2½ million acres were surveyed to map pine areas, ascertain effectiveness of control, and to determine the need and timing of future control work. When initial control has been established on the 23 million acres, an annual maintenance program will be needed to keep this disease in check.

As a new approach in the control of the blister rust disease, the Forest Service has been experimenting for several years with the use of antibiotic fungicides to treat the blister rust infection in western white pine. Large-scale testing in 1957 and 1958 showed such good results that about 4 million trees were treated in the northern Rockies by this method in 1959. Treatment consists of spraying the basal stems of infected trees with a mixture of an antibiotic (cycloheximide) and stove oil. Enough of the antibiotic penetrates the bark and is translocated upward and outward to kill all blister rust infection up to 40 feet above the ground. Further experimentation is underway to develop the full potential of this most promising approach to the blister rust control problem.

Development of rust-resistant pines is another approach the Forest Service is experimenting with to control this disease. Good progress was made in all white pine growing regions toward the production of seed orchard stock which will produce rust-resistant progeny for planting purposes. This approach is the ultimate solution of the blister rust problem, but one which is still a long way in the future.

The Forest Service participates in Federal-State share-the-cost programs to control the oak wilt disease, which threatens extensive damage to oak trees in the Central and Eastern States. In 1959 aerial surveys were made over 41 million acres of non-Federal land in Pennsylvania, West Virginia, Virginia, Kentucky, North Carolina, and Arkansas. These surveys resulted in the location and treatment of 4,052 infected trees. Nineteen infected trees were found and treated as a result of aerial surveys covering 4 million acres in five national forests in Kentucky, West Virginia, Virginia, and Arkansas.

Direct control of dwarfmistletoe, a parasitic disease of conifers, was pilot-tested by the Forest Service in four regions—Northern, Rocky Mountain, California, and Pacific Northwest. These tests were designed to develop methods of control and to determine costs and operational problems in infected ponderosa pine, Douglas-fir, and lodgepole pine stands. Approximately 65,000 infected trees were treated on 2,928 acres

of national-forest land. Also, 42,000 acres were intensively surveyed to develop techniques and criteria for selecting stands requiring direct control treatment.

The Department of the Interior also carried on small mistletoe control projects in Grand and Bryce Canyon National Parks and in Organ Pipe Cactus National Monument.

As a preventive measure against damaging disease outbreaks, the Forest Service gives emphasis in its planting programs, cutting practices, timber stand improvement, and other resource management activities to handling the forest environment so as to remove the underlying causes of abnormal pest activity. Detection surveys are made to locate as quickly as possible any developing pest trouble. In 1959, large volumes of diseased timber were cut and utilized through commercial sales.

Insects

Suppression projects were directed against 16 species of bark beetles and weevils and 8 species of defoliators on 80 national forests in 1959. Cooperative projects on non-Federal land wherein the Federal Government assisted the States and landowners were carried out in 15 States.

As in recent years, the use of chemicals played an important role in all suppression projects. Bark-penetrating insecticides, chiefly emulsions of ethylene dibromide, were used to treat 678,092 trees, cull logs, and stumps on national forests infested by bark beetles, and 6,971 units on non-Federal land. DDT was aerially applied to suppress spruce budworm populations on 134,121 acres (115,388 national forest and 18,733 non-Federal) in Montana and Minnesota. In addition, DDT or other appropriate insecticides were applied on 47,261 acres to suppress outbreaks of the Douglas-fir tussock moth, jack pine budworm, elm spanworm, European pine, shoot moth, Saratoga spittlebug, red-headed pine sawfly, pine sawfly, pine reproduction weevil, and white pine weevil on national forests and State and private lands.

Pilot tests designed to develop and expand promising research findings test the value of new techniques under field conditions, and obtain answers to troublesome insect suppression projects received noteworthy attention in 1959.

Cooperative tests included: aerial spraying test with the State of New York against the white pine weevil; ground spraying test with the State of North Carolina and Department of the Interior against the balsam woolly aphid; and biological control test with the Agricultural Research Service against the balsam woolly aphid in Maine. Tests were also made to improve suppression of the black turpentine beetle in Louisiana, cone and seed insects in Washington; and the European pine shoot moth in Pennsylvania.

On lands administered by the Department of the Interior, Forest Pest Control Act funds were used to suppress outbreaks of 8 species of bark beetles and 9 species of defoliators. Approximately 9,600 beetle-infested trees were treated and 6,100 acres were treated to control defoliators. Technical assistance on most projects was provided by the Forest Service.

FLOOD PREVENTION

Flood Prevention Projects

The Forest Service continued work on seven flood prevention projects authorized under the Flood Control Act of 1944. During fiscal 1959, 53 million trees were planted on 57,560 acres of eroding and flood producing lands. Ninety-five percent of these trees were planted on the Little Tallahatchie River and Yazoo River projects in Mississippi through the combined efforts of the Forest Service, Soil Conservation Service, Agricultural Conservation Program Service, Agricultural Extension Service, Conservation Reserve, and local farmers.

Technical forestry assistance was given to 3,538 landowners and operators. Improved forest management was extended to 50,779 acres of privately owned land, and 18 miles of sediment-producing logging roads on private land were stabilized. Ten debris basins were constructed, 2 miles of stream channel were stabilized, and erosion control measures were applied to 9 miles of mountain roads. Construction of 15 miles of firebreaks, making available additional mobile equipment and buildings to house fire protection personnel, and radio installations strengthened fire prevention and control on about 90,000 acres of national-forest land.

Public Law 566 Projects

The Forest Service helps local organizations plan and carry out watershed protection and flood prevention programs under Public Law 566 (83d Congress) as amended.

During fiscal 1959, the Forest Service worked with State Foresters, the Soil Conservation Service, and local sponsors in planning improvements for 317 small watersheds. Plans were approved and installations authorized on 73 projects, 52 of which include accelerated programs for improvement of forest lands. Approximately 6 million trees were planted on 5,789 acres of privately owned land, and technical forestry assistance was given to 678 landowners. Protection from forest fire was extended or strengthened on 221,448 acres.

On national-forest rangelands, improvements installed during the year included the revegetation of 154 acres of sediment-producing land, erosion control on 23 miles of road, the building of 10 miles of fire control roads into inaccessible areas,

and the improvement of 1.5 miles of mountain stream channel.

Emergency Flood Prevention

During fiscal 1959, emergency flood prevention measures were applied on six burned-over areas of national-forest land in southern California. These measures included aerial seeding of about 66,100 acres to quick-growing grass and mustard and treatment of fills and roadbanks on 95 miles of roads to prevent movement of sediment into stream channels.

Federal, State, and local agencies cooperated in seeding about 9,200 acres of denuded non-national-forest land and in installing other measures such as channel clearing, debris basins, and road emergency treatment.

River Basin Studies

Forest Service participation with other agencies of the U.S. Department of Agriculture on reappraisal of projects authorized under the Upper Colorado Storage Act was continued. During 1959 reports on the forestry impacts of two additional projects were completed. Field studies of the forest-land aspects of water control and water supply requirements in the Delaware River Basin were also completed. Similar studies on the Potomac River Basin were continued.

The Forest Service assisted the Southeast and Texas River Basin U.S. Study Commissions by releasing hydrology specialists for employment by the Southeast Commission and by assigning other personnel to collaborate with these Study Commissions and their staffs in collecting and analyzing basic data regarding forest resources in these basins.

Arrangements were completed for the Forest Service to join with the Soil Conservation Service and the Agricultural Research Service in providing assistance to the State of Oregon for a study of land and water resources and development needs in the Upper Willamette and Deschutes River Basins in Oregon. Preliminary arrangements were completed for similar studies of the Tombigbee River Basin in Alabama and Mississippi, the Humboldt River Basin in Nevada, and the Sevier River Basin in Utah.

Forest Service membership was provided on interagency river basin technical subcommittees for hydrology, sedimentation, phreatophyte control, and recreation.

Pilot Projects

The watershed demonstration or pilot program on 58 small watersheds, authorized in 1954, is nearing completion. About 99 percent of the forestry measures planned for national-forest and non-Federal forest lands have been installed.

In fiscal 1959, the Forest Service, State Foresters, Soil Conservation Service, and local project sponsors worked together on 16 projects. Technical forestry assistance was given 387 landowners. Approximately 1.5 million trees were planted on 1,478 acres, and improved forest management was provided on 2,600 acres. On national-forest land, 16.5 miles of gullies were stabilized, 13 stabilization and sediment control structures were constructed, 156 acres of severely eroding forest range were revegetated, and 8 miles of fence to prevent grazing damage were installed.

Watershed Management Tour

A major effort toward improving international understanding of watershed management was made by the U.S. Government in 1959. The Government was host to 33 representatives from 19 nations on a Watershed Management Tour and Seminar sponsored by the Food and Agriculture Organization of the United Nations. Working in cooperation with other Federal agencies, the Forest Service was assigned leadership in planning and conducting the seminar and tour. The tour director was provided by the Forest Service. The visitors participated in 8 weeks of seminar and field inspection of typical watershed management activities from coast to coast.

Program Planning and Legislation

PROGRAM PLANNING AND SPECIAL PROJECTS

Small Ownership Study Continued

A careful and thorough analysis of all existing information pertaining to small forest ownerships as background material for program formulation was concluded during the year. This material represents the most complete compilation of data on the small ownership situation, problems, and programs that has ever been brought together.

The background material comprises the following: (1) Material from the Timber Resource Review and other studies on resource conditions and needs and an analysis of special studies made in various localities throughout the country of owner characteristics, attitudes, interests, and the relation between owners and their forest properties. Such studies point up some of the key problems and opportunities of getting intensified management applied to small woodlands. (2) A digest of what many people considered to be the major problems and their views concerning needed programs and the sharing of responsibilities, as expressed at the regional small woodland meetings held in the fall of 1958. (3) A summary of programs proposed voluntarily by individuals and groups and sent directly to the Forest Service.

(4) A summary of existing Federal and cooperative State-Federal programs in extension, forest management, forest-fire control, forest pest control, tree planting and distribution, marketing, and small watersheds. (5) A summary of existing programs sponsored by private groups such as tree farms, tree farm families, keep green campaign, Conwood Inc., Sears Foundation, and others. (6) An analysis of programs relating to small forest ownerships in Sweden, Norway, and Finland. (7) A digest of all past legislative proposals, not enacted, having to do with improving the situation on small forest holdings. (8) A summary of existing institutional sources of forest credit and appraisal of sources of forest insurance.

Now underway are studies of possible measures which would constitute an adequate program to help assure that the farm and other small woodlands of the country will meet their share of the Nation's timber needs by the year 2000.

Recreation Projections

Projections of future increasing recreation demands on national-forest lands described under "Forest Recreation" were made by the Program Planning and Special Projects Division.

LEGISLATIVE REPORTING

In 1959, about 450 bills were introduced in Congress which would affect Forest Service activities, and the Service prepared legislative reports on 273 of those bills. Hearings were held and testimony presented by the Forest Service on 17 bills. Congress passed 8 bills which were of specific interest to the Forest Service, and 14 others which were of general interest to it. In addition, legislative drafting service was provided as requested by a number of Congressmen.

Administration

Administrative management was given extensive study during 1959, and several improvements were instituted. Pilot studies were begun on sample ranger districts to determine the effect of intensified resource management. Bases used for allotment of funds and guides to staffing needs were brought up to date. A new manual, handbook, and filing system designed to meet current needs were put into effect. Specialized training programs were given to increase scientific and managerial competence of employees.

Management Studies

On four sample ranger districts, studies are being made to determine the effect of intensified resource management on organization and manning. Two of the sample districts are located in the East and two in the West. The objectives of the studies are to provide a basis for measuring the full benefits in products and public service to be derived from a district under intensified management, to find ways of improving estimates of demand and financial needs, ascertain the possible effect on job standards and workloads, and foresee administrative problems that might arise from intensified management.

Workload Analysis

A complete revision was made of the workload analysis for regional offices, national forests, and ranger districts. This was done to provide an up-to-date base for allotment of funds and a guide for determining staffing needs. The revised bases were for use in the budget development for fiscal 1960.

Manual and Filing System

The new Forest Service Manual and Handbook, with the exception of a few sections, were printed and put into effect. The manual and handbook contain information that employees need on organization, program objectives, policies, and responsibilities; authorizations; and procedures for performing work.

A filing system designed to meet current operational needs was completed and installed service-wide on July 1. This system is coordinated with the new Forest Service Manual and uses the same numeric and subject designations. Numbering of standard forms and the workload analyses were also under the same numeric system.

PERSONNEL

Forest Service personnel on June 30, 1959, totaled 13,359 permanent yearlong and 12,093 temporary seasonal employees.

During 1959, 129 people retired—optionally or because they reached mandatory retirement age. They averaged 25.73 years of service and 63.51 years of age.

Injury Rate Up Slightly

Injury frequency rate increased from 6.65 (per million man-hours of work) last year to 7.64 in 1959. Accidental deaths totaled 16, two more than in the previous year. Disastrous forest fires in the West claimed the lives of 14 of these employees.

Recruiting Professional Employees

Professional employees, new to the Forest Service, recruited and employed during the year included 460 foresters, 160 engineers, and 15 business administrators and accountants.

Employee Development

Forest Service employee development was strengthened and extended in 1959. There has been significant increase in educational leave for work on advanced college degrees, particularly by men in research. Intensive training in some functions was given in order to meet the increased demand for scientific and managerial competence. Individual training-work plans have accelerated self-development. Sharpened priorities in personnel development have made field programs more effective. Cooperation from the U.S. Navy, Army, Air Force, the Civil Service Commission, and selected universities has helped strengthen communication and instructorship skills throughout the Service. Overall results in employee development are enhancing career opportunities in the Forest Service.

BUDGET AND FINANCE

The first Forest Service cost-based budget was submitted to the Bureau of the Budget and Congress. This covered fiscal year 1961 estimates and was prepared from accounting records which are now maintained on an accrual basis.

Working Capital Fund activities were expanded to include both aircraft and nursery operations.

RECEIPTS AND EXPENDITURES

Receipts from the national-forest resources amounted to $122,147,555 in fiscal year 1959. Sources of the receipts were as follows:

Timber	$115, 807, 988
Grazing	3, 750, 915
Other	2, 588, 652
Total	122, 147, 555

Included are receipts of $3,326,944 from national-forest revested Oregon and California Railroad grant lands.

Additional resource revenue included $1,919,-236 from land utilization areas (Title III of the Farm Tenant Act). Other money collected: $841,729 contributed by cooperators and timber purchasers for work on national-forest programs; $11,444,937 set aside for timber sale area betterment; $5,795,594 set aside for brush disposal; and $586,202 from miscellaneous receipts.

Thus receipts from all sources totaled $142,735,-253. In addition, the value of roads built by timber purchasers through allowances in selling prices of timber was estimated at $39,650,633. Operating expenses for national-forest programs and land utilization projects amounted to $91,-420,185, and depreciation on roads, trails, and other improvements was estimated at $21,840,000. Receipts and other income exceeded operating expenditures and other charges by $69,125,701 for fiscal year 1959.

Expenditures for other Forest Service activities included $19,438,152 for cooperative State and Private Forestry programs and $17,421,301 on forestry research.

Under the act of May 23, 1908, as amended, 25 percent of national-forest net receipts is paid to States for schools and roads within counties having national-forest land. In fiscal 1959 this amounted to $22,204,787. Under the act of June 20, 1910, $117,161 was paid to Arizona and New Mexico school funds, and $48,240 was paid to the State of Minnesota under the act of June 22, 1948.

Ten percent of the receipts from national-forest resources, except receipts from revested O&C lands, is appropriated to the Forest Service for expenditure on roads and trails within the national forests. This amounted to $8,884,693 in fiscal 1959.

Internal Audit

This unit independently appraises operational, managerial, and financial activities of the Forest Service and is directly responsible to the Chief of the Forest Service. It operates on a service-wide basis through a central staff in the Washington office and three field offices. Internal Audit, established in 1957, completed during 1959 its first cycle of auditing each region, experiment station, and the Forest Products Laboratory—a total of 20 units. In addition, the three field offices audited 49 national forests, bringing the total national forests audited to 70 at the close of the calendar year 1959.

Statistical Tables

TABLE 1.—*National-forest and other lands administered by the Forest Service, as of June 30, 1959*

States and territory	National-forest land	Land utilization projects	Other land	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	620, 532	10, 777	661	631, 970
Alaska	20, 742, 280			20, 742, 280
Arizona	11, 328, 938		52, 604	11, 381, 542
Arkansas	2, 367, 824	61, 927	1, 686	2, 431, 437
California	19, 939, 957	19, 115	4, 767	19, 963, 839
Colorado	13, 722, 833	636, 085		14, 358, 918
Florida	1, 074, 742			1, 074, 742
Georgia	668, 974	116, 704		785, 678
Idaho	20, 291, 367	49, 770		20, 341, 137
Illinois	211, 013			211, 013
Indiana	117, 906	3, 180		121, 086
Iowa	4, 749	946		5, 695
Kansas		107, 039		107, 039
Kentucky	458, 523			458, 523
Louisiana	560, 571	31, 155		591, 726
Maine	45, 862	465	3, 694	50, 021
Massachusetts			1, 651	1, 651
Michigan	2, 551, 736	7, 417	8	2, 559, 161
Minnesota	2, 786, 387			2, 786, 387
Mississippi	1, 047, 083	85, 518	1, 211	1, 133, 812
Missouri	1, 361, 148	12, 938		1, 374, 086
Montana	16, 635, 487			16, 635, 487
Nebraska	206, 082	133, 634		339, 716
Nevada	5, 058, 067			5, 058, 067
New Hampshire	677, 533			677, 533
New Mexico	8, 571, 076	424, 340	8, 792	9, 004, 208
New York		13, 747		13, 747
North Carolina	1, 124, 044			1, 124, 044
North Dakota	520	1, 104, 012		1, 104, 532
Ohio	106, 129			106, 129
Oklahoma	185, 839	81, 269		267, 108
Oregon	14, 829, 570	105, 925		14, 935, 495
Pennsylvania	470, 862			470, 862
South Carolina	587, 274			587, 274
South Dakota	1, 120, 446	883, 227		2, 003, 673
Tennessee	594, 770	1, 212		595, 982
Texas	657, 994	117, 268		775, 262
Utah	7, 811, 363	53, 404	62, 666	7, 927, 433
Vermont	230, 954			230, 954
Virginia	1, 446, 682	2, 683		1, 449, 365
Washington	9, 688, 607			9, 688, 607
West Virginia	903, 878			903, 878
Wisconsin	1, 467, 262	1, 290	17	1, 468, 569
Wyoming	8, 568, 392	573, 466		9, 141, 858
Puerto Rico	33, 037	27		33, 064
Total	180, 878, 293	4, 638, 540	137, 757	185, 654, 590

TABLE 2.—*Area of commercial timberland, volume of sawtimber, and total timber volume in the national forests, Jan. 1, 1960*

State	Commercial forest land	Sawtimber volume	Total timber volume [1]
	Thousand acres	*Million board feet*	*Million board feet*
Alabama	624	1, 506	2, 224
Alaska	5, 375	158, 970	169, 888
Arizona	2, 280	13, 547	14, 772
Arkansas	2, 328	3, 973	6, 532
California	8, 644	134, 107	137, 578
Colorado	6, 267	20, 484	28, 762
Florida	1, 030	665	2, 749
Georgia	764	1, 314	2, 014
Idaho	9, 272	69, 653	91, 834
Illinois	184	385	560
Indiana	112	162	373
Kentucky	439	1, 272	2, 453
Louisiana	569	1, 240	1, 990
Maine	51	55	136
Michigan	2, 415	1, 419	6, 164
Minnesota	2, 193	1, 987	6, 558
Mississippi	1, 108	2, 467	3, 938
Missouri	1, 339	997	1, 220
Montana	10, 542	39, 833	67, 718
Nebraska	30		
Nevada	204	107	129
New Hampshire	452	858	2, 131
New Mexico	3, 136	8, 384	9, 055
North Carolina	975	2, 253	3, 086
Ohio	88	145	342
Oklahoma	176	211	611
Oregon	10, 996	204, 986	225, 471
Pennsylvania	451	553	3, 081
South Carolina	566	1, 600	2, 700
South Dakota	990	2, 190	3, 066
Tennessee	587	1, 093	2, 293
Texas	640	2, 558	3, 953
Utah	2, 237	11, 843	16, 965
Vermont	199	665	1, 048
Virginia	1, 070	1, 611	5, 859
Washington	5, 641	122, 817	137, 344
West Virginia	869	1, 605	3, 794
Wisconsin	1, 367	1, 048	4, 116
Wyoming	3, 366	17, 511	24, 653
Total	89, 576	836, 074	997, 160

[1] Net volume of all live trees 5 inches d.b.h. and larger.

TABLE 3.—*Volume and value of timber cut from the national forests, and area planted and seeded to trees, fiscal year 1959*

States and territory	Timber cut		Area planted and seeded to trees	
	Volume	Value [1]	Fiscal year 1959	Total through June 30, 1959
Alabama	65, 685	1, 151, 846	2, 044	49, 614
Alaska	226, 603	509, 841	540	830
Arizona	218, 568	1, 462, 381		2, 997
Arkansas	177, 801	3, 807, 952	2, 958	19, 671
California	1, 295, 412	14, 922, 076	9, 466	82, 554
Colorado	173, 707	1, 068, 176	933	70, 317
Connecticut				
Delaware				
Florida	65, 569	812, 136	7, 173	40, 551
Georgia	50, 684	1, 082, 186	3, 860	22, 919
Idaho	614, 561	4, 520, 546	4, 761	111, 928
Illinois	3 490	40, 806	675	43, 811
Indiana	1, 048	6, 960	941	20, 745
Iowa	58	366	40	40
Kansas				
Kentucky	22, 070	260, 256	288	1, 100
Louisiana	75, 079	1, 203, 495	6, 920	115, 186
Maine	699	10, 888		67
Maryland				
Massachusetts				
Michigan	125, 323	676, 494	5, 693	566, 800
Minnesota	118, 801	533, 983	3, 581	150, 312
Mississippi	135, 610	2, 126, 224	5, 648	159, 922
Missouri	32, 272	189, 455	2, 957	73, 554
Montana	445, 254	3, 147, 929	2, 274	48, 820
Nebraska	123	263	26	30, 045
Nevada	219	1, 495	5	402
New Hampshire	18, 781	199, 829	6	1, 162
New Jersey				
New Mexico	104, 475	661, 442	152	3, 182
New York	75	278		
North Carolina	54, 853	924, 524	2, 043	17, 594
North Dakota	51	523		
Ohio	1, 917	15, 527	1, 576	15, 889
Oklahoma	11, 672	136, 727	34	111
Oregon	2, 544, 126	47, 654, 597	26, 468	172, 686
Pennsylvania	19, 026	400, 590	143	18, 272
Rhode Island				
South Carolina	71, 845	1, 716, 065	790	19, 709
South Dakota	52, 079	295, 463	1, 979	36, 469
Tennessee	26, 960	451, 579	626	6, 728
Texas	121, 840	2, 517, 214	960	50, 997
Utah	50, 547	172, 116	42	4, 075
Vermont	7, 456	123, 267		1, 406
Virginia	44, 712	239, 138	218	4, 808
Washington	1, 190, 843	19, 807, 879	14, 684	169, 049
West Virginia	25, 459	247, 205	238	16, 222
Wisconsin	53, 827	340, 83º	1, 194	227, 963
Wyoming	91, 148	455, 867	146	7, 769
Puerto Rico	190	274		
Total	8, 340, 518	113, 896, 697	112, 082	2, 386, 276

[1] Value of timber shown here is lower than timber receipts noted elsewhere in the text because receipts include some advance payments for timber not yet cut.

TABLE 4.—*Number of livestock permitted to graze on the national forests, calendar year 1959*

State	Cattle, horses, and swine		Sheep and goats	
	Paid permits	Number livestock permitted to graze	Paid permits	Number livestock permitted to graze
Alabama	8	575	0	0
Alaska	0	15	0	0
Arizona	877	148, 338	24	73, 188
Arkansas	141	1, 492	0	0
California	1, 143	106, 768	66	99, 719
Colorado	1, 657	144, 913	430	518, 570
Florida	15	1, 348	0	0
Georgia	12	99	0	0
Idaho	1, 770	109, 902	328	567, 005
Illinois	11	94	0	0
Indiana	2	7	0	0
Iowa	7	172	0	0
Louisiana	57	1, 600	0	0
Michigan	41	518	0	22
Minnesota	24	251	1	18
Mississippi	79	1, 207	0	0
Missouri	231	2, 835	0	0
Montana	1, 740	117, 344	123	183, 078
Nebraska	54	12, 099	0	0
Nevada	250	53, 571	44	122, 533
New Mexico	1, 710	80, 616	106	68, 821
North Carolina	10	125	0	0
Ohio	12	23	0	0
Oklahoma	3	20	0	0
Oregon	844	72, 367	93	123, 167
Pennsylvania	2	35	0	0
South Carolina	12	314	0	0
South Dakota	537	20, 708	20	10, 454
Tennessee	9	163	0	0
Texas	148	1, 511	0	0
Utah	2, 648	101, 811	621	429, 052
Vermont	5	46	0	0
Virginia	13	89	2	80
Washington	424	25, 009	21	20, 637
West Virginia	60	705	12	524
Wisconsin	15	216	0	0
Wyoming	981	110, 089	199	348, 513
Total	15, 552	1, 116, 995	2, 090	2, 565, 381

TABLE 5.—*Estimated legal harvest*[1] *of big-game animals on the national forests, fiscal year 1959*

State	Deer	Elk	Bear	Bighorn	Total big game[2]
Alabama	580				580
Alaska	14, 000	75	610	15	15, 000
Arizona	26, 000	200	110		28, 000
Arkansas	1, 400				1, 400
California	34, 000		580		35, 000
Colorado	46, 000	8, 400	550	60	55, 000
Florida	1, 100		15		1, 100
Georgia	670				700
Idaho	35, 000	11, 000	1, 400	75	49, 000
Illinois	550				550
Indiana	90				90
Kentucky	520				520
Louisiana	580				580
Maine	150		15		170
Michigan	23, 000		390		23, 000
Minnesota	9, 000		630		9, 600
Mississippi	1, 200				1, 200
Missouri	4, 100				4, 100
Montana	50, 000	7, 900	915	70	61, 000
Nebraska	35				35
Nevada	13, 000	15			13, 000
New Hampshire	530		65		590
New Mexico	25, 000	240	150		25, 000
North Carolina	2, 200		180		2, 500
Ohio	260				260
Oklahoma	50				50
Oregon	63, 000	5, 100	790		69, 000
Pennsylvania	6, 200		30		6, 200
South Carolina	520		5		530
South Dakota	9, 000	20			9, 000
Tennessee	860		25		960
Texas	500				500
Utah	88, 000	1, 100	50		89, 000
Vermont	1, 000		60		1, 100
Virginia	13, 000	15	230		13, 000
Washington	16, 000	3, 100	1, 200		21, 000
West Virginia	4, 800		40		4, 800
Wisconsin	11, 000		240		11, 000
Wyoming	24, 000	10, 000	250	100	35, 000
Total	527, 000	47, 000	8, 500	320	589, 000

[1] Figures rounded in posting and totals.
[2] Also includes antelope, moose, mountain goat, peccary, and wild boar.

TABLE 6.—*Construction, reconstruction, and maintenance of national-forest (forest development) roads, bridges, and trails, fiscal year 1959*

States and territory	Roads		Bridges, construction, reconstruction, and replacement	Trails		Total obligations from all funds [1]
	Construction and reconstruction	Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	8. 7	1, 397. 6	1	0	0	194, 485
Alaska	3. 1	195. 1	0	12. 8	607. 9	716, 362
Arizona	101. 1	9, 029. 8	20	1. 0	3, 607. 6	1, 054, 659
Arkansas	12. 5	4, 055. 2	0			493, 955
California	150. 5	27, 736. 7	33	37. 5	15, 478. 9	6, 713, 226
Colorado	114. 2	7, 193. 1	28	9. 8	9, 237. 1	1, 651, 176
Florida	8. 0	1, 454. 1	1	0	0	211, 804
Georgia	9. 4	1, 689. 2	1	0	182. 2	291, 952
Idaho	133. 1	14, 679. 7	54	22. 9	20, 853. 9	4, 938, 385
Illinois	1. 3	831. 3	0	0	0	62, 135
Indiana	0	299. 0	0	0	0	19, 218
Iowa	0	0	0	0	0	0
Kentucky	7. 3	1, 229. 2	1	0	13. 5	138, 761
Louisiana	11. 6	1, 195. 0	11	0	0	131, 528
Maine	1. 7	48. 8	1	0	85. 4	21, 462
Michigan	28. 8	3, 646. 4	1	0	0	440, 428
Minnesota	36. 3	2, 396. 2	7	0	471. 6	1, 193, 590
Mississippi	6. 7	2, 112. 9	0	0	0	203, 475
Missouri	3. 2	2, 310. 0	1	0	0	159, 950
Montana	89. 5	10, 573. 0	46	30. 0	16, 175. 7	2, 972, 488
Nebraska	. 7	239. 7	1	0	0	19, 794
Nevada	0	2, 795. 8	6	0	1, 660. 1	110, 858
New Hampshire	. 9	172. 7	0	6. 4	996. 2	180, 492
New Mexico	62. 2	5, 893. 9	24	5. 0	3, 428. 9	1, 001, 697
North Carolina	15. 7	2, 733. 4	7	0	1, 207. 6	283, 287
North Dakota	0	. 3	0	0	0	64
Ohio	0	237. 0	0	0	0	11, 680
Oklahoma	0	296. 1	0	0	0	18, 424
Oregon	90. 2	18, 372. 5	63	41. 5	10, 786. 6	5, 997, 406
Pennsylvania	3. 2	337. 2	0	0	166. 6	167, 113
Puerto Rico	0	24. 3	0	0	30. 6	142, 545
South Carolina	8. 4	1, 697. 1	4	0	0	178, 364
South Dakota	6. 7	3, 752. 4	10	0	10. 3	241, 339
Tennessee	4. 7	1, 071. 0	3	0	507. 1	181, 262
Texas	35. 3	1, 619. 9	1	0	0	218, 958
Utah	88. 7	5, 534. 5	20	0	6, 369. 3	954, 306
Vermont	2. 7	238. 8	0	0	185. 0	131, 354
Virginia	24. 3	1, 394. 3	8	0	862. 0	311, 380
Washington	64. 1	7, 870. 9	46	42. 1	9, 060. 0	3, 115, 020
West Virginia	9. 5	1, 265. 5	3	0	754. 9	293, 408
Wisconsin	14. 4	1, 878. 8	4	0	0	324, 751
Wyoming	62. 3	3, 846. 4	15	20. 0	5, 589. 8	874, 008
Total	1, 221. 0	153, 344. 8	421	229. 0	108, 328. 8	36, 366, 549

[1] Total obligations are for construction, reconstruction, and maintenance.

TABLE 7.—*Use of recreation resources on the national forests, calendar year 1959*

State and territory	Number of visits to—								
	Campgrounds	Picnic areas	Winter sports areas	Organization camps	Hotels or resorts	Recreation residences	Wilderness areas	Other forest areas	All attractions
Alabama	3, 600	102, 500	0	1, 100	0	0	0	88, 400	195, 600
Alaska	75, 800	122, 900	7, 900	2, 000	43, 400	20, 500	0	507, 700	780, 200
Arizona	575, 200	1, 493, 100	52, 000	33, 100	286, 900	38, 000	11, 200	2, 207, 300	4, 696, 800
Arkansas	38, 000	307, 000	0	20, 400	20, 100	0	0	1, 301, 200	1, 686, 700
California	2, 327, 100	1, 740, 400	1, 508, 700	259, 200	619, 300	344, 700	185, 600	6, 774, 500	13, 759, 500
Colorado	1, 454, 500	1, 424, 900	490, 200	17, 000	975, 700	51, 800	20, 800	4, 300, 400	8, 735, 300
Florida	75, 100	532, 200	0	28, 000	700	11, 800	0	347, 000	994, 800
Georgia	84, 600	576, 200	0	3, 400	8, 000	1, 700	0	511, 800	1, 185, 700
Idaho	541, 600	419, 800	204, 000	36, 000	98, 700	35, 500	39, 500	1, 511, 200	2, 886, 300
Illinois	700	126, 500	0	0	0	0	0	213, 000	340, 200
Indiana	400	23, 500	0	0	0	0	0	94, 500	118, 400
Kentucky	24, 000	160, 100	0	5, 800	31, 500	4, 000	0	342, 900	568, 300
Louisiana	300	128, 200	0	15, 000	83, 300	9, 000	0	109, 800	345, 600
Maine	500	13, 000	0	0	0	0	0	27, 100	40, 600
Michigan	83, 100	223, 600	106, 500	10, 100	5, 500	8, 700	0	1, 423, 500	1, 861, 000
Minnesota	151, 100	96, 000	8, 500	4, 200	18, 200	11, 500	104, 000	983, 200	1, 376, 700
Mississippi	2, 800	139, 600	0	7, 400	30, 000	0	0	541, 800	721, 600
Missouri	9, 500	134, 000	0	10, 600	0	0	0	926, 100	1, 080, 200
Montana	340, 600	364, 800	98, 400	18, 200	49, 900	59, 600	25, 400	1, 467, 600	2, 424, 500
Nebraska	1, 900	38, 000	0	0	0	0	0	13, 900	53, 800
Nevada	137, 600	209, 900	55, 400	4, 800	0	1, 700	100	136, 200	545, 700
New Hampshire	78, 100	385, 600	108, 500	4, 100	68, 400	0	2, 000	1, 762, 300	2, 409, 000
New Mexico	319, 600	1, 142, 200	47, 600	13, 500	1, 800	10, 200	13, 800	1, 499, 700	3, 048, 400
North Carolina	386, 600	970, 100	0	11, 700	12, 500	1, 700	38, 000	1, 456, 200	2, 876, 800
Ohio	2, 500	60, 400	0	0	0	0	0	85, 300	148, 200
Oklahoma	1, 800	37, 300	0	0	0	0	0	17, 600	56, 700
Oregon	970, 600	1, 081, 600	399, 000	31, 700	1, 566, 900	57, 200	40, 100	1, 181, 300	5. 328, 400
Pennsylvania	8, 200	211, 500	0	13, 800	0	23, 700	0	848, 500	1, 105, 700
South Carolina	500	276, 100	0	0	0	0	0	240, 300	516, 900
South Dakota	267, 700	798, 700	800	10, 100	14, 800	18, 800	0	1, 499, 100	2, 610, 000
Tennessee	84, 700	993, 600	0	27, 300	40, 000	23, 500	0	824, 300	1, 993, 400
Texas	10, 100	162, 100	0	800	0	0	0	207, 700	380, 700
Utah	681, 800	3, 013, 600	442, 600	46, 500	73, 500	59, 100	31, 700	1, 259, 100	5, 607, 900
Vermont	2, 300	62, 000	169, 000	0	0	0	0	167, 400	400, 700
Virginia	55, 500	291, 100	0	9, 600	0	500	0	2, 407, 400	2, 764, 100
Washington	644, 100	655, 900	402, 600	45, 800	197, 400	54, 300	8, 700	1, 149, 200	3, 158, 000
West Virginia	200, 600	238, 000	0	6, 000	0	0	0	602, 900	1, 047, 500
Wisconsin	44, 100	139, 600	9, 900	5, 400	300	1, 800	0	360, 500	561, 600
Wyoming	269, 000	330, 200	72, 500	23, 500	189, 600	40, 200	43, 800	1, 875, 400	2, 844, 200
Puerto Rico	0	57, 500	0	4, 000	161, 000	6, 800	0	36, 000	265, 300
Total	9, 955, 800	19, 283, 300	4, 184, 100	730, 100	4, 597, 400	896, 300	564, 700	41, 309, 300	81, 521, 000

TABLE 8.—*Fires controlled by national-forest fire organizations to protect national-forest lands, and area burned, calendar year 1959*

State	Fires						Area burned	
	Lightning	Campfire	Smoker	Incendiary	Other causes	Total[1]	National forest	Other ownerships[2]
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Acres*
Alabama	11	3	24	26	22	86	298	430
Alaska	1	6	1		9	17	3, 347	
Arizona	1, 402	64	62	2	93	1, 623	33, 672	639
Arkansas	25	8	26	27	63	149	701	459
California	853	115	271	66	491	1, 796	132, 580	37, 185
Colorado	197	54	39		36	326	157	3
Florida	39		16	19	15	89	1, 601	201
Georgia	2	4	12	19	26	63	157	110
Idaho	641	49	44	4	56	794	4, 539	249
Illinois		2	8	14	37	61	171	395
Indiana			4		15	19	33	86
Kentucky	2	2	15	8	27	54	259	298
Louisiana	1	5	19	42	27	94	998	839
Maine	1					1		
Michigan	4	8	28	1	60	101	38	283
Minnesota	5	19	26	6	46	102	203	505
Mississippi	4	3	32	110	73	222	977	613
Missouri	6	12	60	133	165	376	1, 541	1, 935
Montana	209	43	53		92	397	1, 256	600
Nebraska	5					5	182	
Nevada	45	4	10		4	63	3, 345	
New Hampshire	1				1	2	5	
New Mexico	675	136	33		41	885	883	57
North Carolina	3	4	19	35	53	114	287	1, 266
Ohio		1	31	11	70	113	208	570
Oklahoma	3	1	1	15	10	30	1, 167	260
Oregon	324	146	97	11	163	741	19, 622	1, 341
Pennsylvania	1		3		9	13	21	10
South Carolina	2	2	17	22	36	79	328	455
South Dakota	124	4	4		31	163	1, 282	1, 022
Tennessee	1	2	8	105	39	155	2, 255	1, 234
Texas	1	3	21	9	36	70	135	314
Utah	165	38	27		41	271	3, 772	784
Vermont	1		1		4	6	1	2
Virginia	12		29	15	81	137	174	655
Washington	41	49	44	4	73	211	107	384
West Virginia	2	4	8		14	28	7	60
Wisconsin		7	14	5	20	46	263	46
Wyoming	82	19	14		18	133	307	
Total	4, 891	817	1, 121	709	2, 097	9, 635	216, 879	53, 290

[1] Includes 6,871 fires on national-forest land, and 2,764 on lands in other ownerships within and adjacent to the national forests.

[2] Within and adjacent to the national forests.

TABLE 9.—*Forest fires on protected State and private lands, and area burned, calendar year 1959; and expenditures for control, fiscal year 1959* [1]

States	Area protected	Fires	Area burned	Prevention and suppression expenditures			
				Federal	State and county	Private [2]	Total
	Thousand acres	*Number*	*Acres*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	19, 990	6, 099	117, 231	351, 400	834, 967	130, 274	1, 316, 641
Arkansas	16, 535	3, 031	68, 728	296, 200	797, 649	84, 498	1, 151, 347
California	19, 810	2, 473	127, 473	1, 288, 400	12, 120, 810		13, 349, 210
Colorado	7, 404	259	2, 859	32, 400	79, 370		111, 770
Connecticut	1, 989	452	1, 871	42, 700	138, 391		181, 091
Delaware	453	82	318	13, 500	16, 010		29, 510
Florida	16, 931	3, 851	46, 339	584, 300	2, 673, 777	194, 923	3, 453, 000
Georgia	21, 641	6, 423	62, 166	532, 500	2, 467, 227	32, 495	3, 032, 222
Hawaii	1, 152	75	2, 790	14, 056	14, 057		28, 113
Idaho	7, 343	382	37, 542	142, 200	340, 447	102, 194	584, 841
Illinois	3, 170	374	12, 548	45, 700	133, 754		179, 454
Indiana	3, 931	375	6, 757	50, 000	135, 993		185, 993
Iowa	2, 277	9	283	25, 000	28, 431		53, 431
Kentucky	7, 779	3, 163	107, 907	140, 500	432, 606		573, 106
Louisiana	11, 899	6, 107	113, 901	334, 400	1, 399, 990	20, 020	1, 754, 410
Maine	16, 973	485	6, 571	220, 900	764, 094		984, 994
Maryland	2, 850	511	1, 931	100, 800	488, 376		589, 176
Massachusetts	3, 252	3, 951	8, 433	116, 900	326, 178		443, 078
Michigan	17, 205	799	3, 945	428, 800	1, 776, 592		2, 205, 392
Minnesota	17, 771	1, 067	91, 957	277, 400	1, 859, 043		2, 136, 443
Mississippi	13, 881	8, 174	137, 513	308, 600	1, 549, 262		1, 857, 862
Missouri	9, 597	3, 414	99, 867	189, 500	720, 748		910, 248
Montana	6, 915	261	11, 167	103, 300	84, 329	199, 752	387, 381
Nebraska [3]	750			4, 047	4, 047		8, 094
Nevada	2, 216	127	3, 801	30, 000	123, 182		153, 182
New Hampshire	4, 182	495	457	67, 600	239, 808	6, 658	314, 066
New Jersey	2, 095	1, 280	13, 374	91, 000	397, 195		488, 195
New Mexico	1, 732	76	422	30, 000	69, 467		99, 467
New York	12, 995	1, 072	10, 499	221, 500	857, 348		1, 078, 848
North Carolina	17, 210	3, 091	85, 540	310, 500	1, 145, 163	29, 776	1, 485, 439
North Dakota	121	22	124	4, 910	4, 910		9, 820
Ohio	3, 923	1, 326	10, 834	83, 500	253, 925		337, 425
Oklahoma	4, 488	894	152, 246	137, 300	146, 484	19, 667	303, 451
Oregon	12, 141	716	33, 979	561, 300	1, 740, 970	714, 759	3, 017, 029
Pennsylvania	14, 704	985	25, 817	169, 500	690, 242		859, 742
Rhode Island	434	93	215	32, 700	114, 468		147, 168
South Carolina	11, 175	3, 426	30, 704	269, 200	1, 200, 769		1, 469, 969
South Dakota	2, 827	72	3, 448	30, 000	46, 065		76, 065
Tennessee	10, 171	3, 798	35, 017	240, 100	912, 057	3, 833	1, 155, 990
Texas	9, 325	1, 847	70, 621	236, 800	616, 968	118, 667	972, 435
Utah	5, 351	192	4, 286	34, 900	114, 715		149, 615
Vermont	3, 517	177	555	30, 000	49, 202		79, 202
Virginia	14, 033	2, 409	15, 420	243, 300	967, 994	5, 465	1, 216, 759
Washington	12, 237	751	5, 545	566, 800	2, 186, 859	250, 000	3, 003, 659
West Virginia	9, 007	1, 908	78, 191	122, 700	571, 440		694, 140
Wisconsin	15, 297	1, 228	30, 014	331, 300	1, 435, 170		1, 766, 470
Wyoming [3]							
Total	400, 679	77, 802	1, 681, 206	9, 401, 413	43, 070, 549	1, 912, 981	54, 384, 943

[1] This table does not include 17,925 fires and 1,577,440 acres burned on 34 million acres of unprotected lands.
[2] Private expenditures, spent under direct supervision of State forester, as part of the Clarke-McNary program.
[3] Data incomplete.

TABLE 10.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1959 (under Clarke-McNary Program)*

States and territory	Seedlings and transplants shipped	Expenditures			
		Federal funds	State appropriated funds	Receipts from sale of stock used in program	All sources
	Thousands	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	97,074	0	0	227,259	227,259
Alaska		0	0	0	0
Arizona		0	0	0	0
Arkansas	33,359	0	0	122,240	122,240
California	1,825	25,000	60,227	17,350	102,577
Colorado	458	6,800	15,236	16,984	39,020
Connecticut	1,554	6,754	16,575	25,650	48,979
Delaware	1,138	8,950	9,467	0	18,417
Florida	98,271	0	0	531,800	531,800
Georgia	130,233	0	0	237,712	237,712
Hawaii	348	18,000	113,086	0	131,086
Idaho	559	7,684	9,608	9,739	27,031
Illinois	6,577	17,000	43,553	95,263	155,816
Indiana	5,906	20,000	158,376	83,077	261,453
Iowa	1,345	0	0	37,780	37,780
Kansas	556	3,797	31,447	23,852	59,096
Kentucky	12,523	27,608	61,001	104,494	193,103
Louisiana	71,155	16,010	32,301	274,444	322,755
Maine	127	16,500	17,916	7,108	41,524
Maryland	3,919	20,250	36,387	1,830	58,467
Massachusetts	911	12,811	12,811	16,066	41,688
Michigan	17,895	17,000	96,023	182,255	295,278
Minnesota	20,368	22,000	157,414	114,140	293,554
Mississippi	84,467	48,300	48,770	315,657	412,727
Missouri	3,106	20,000	27,292	13,074	60,366
Montana	918	11,626	11,626	31,661	54,914
Nebraska	1,343	2,591	2,591	46,015	51,197
Nevada		0	0	0	0
New Hampshire	1,277	17,855	17,855	10,144	45,853
New Jersey	727	8,844	8,844	11,058	28,746
New Mexico		0	0	0	0
New York	25,736	22,000	148,148	186,594	356,742
North Carolina	55,767	17,000	27,322	213,807	258,129
North Dakota	597	9,117	9,263	15,585	33,965
Ohio	12,754	20,000	76,665	125,661	222,326
Oklahoma	3,439	21,144	23,732	14,534	59,410
Oregon	8,800	9,000	14,201	80,528	103,729
Pennsylvania	12,400	22,000	100,008	74,400	196,408
Puerto Rico	741	15,000	32,000	0	47,000
Rhode Island	252	6,150	7,252	2,976	16,378
South Carolina	46,290	24,525	38,598	141,156	204,279
South Dakota	1,389	6,550	6,550	39,828	52,928
Tennessee	51,364	0	18,004	185,581	203,585
Texas	38,732	31,660	44,861	200,570	277,091
Utah	132	5,812	6,113	1,155	13,080
Vermont	3,193	20,250	30,338	19,860	70,448
Virginia	38,537	20,000	21,398	167,575	208,973
Washington	562	5,897	6,039	8,647	20,583
West Virginia	4,489	27,607	42,152	71,069	140,828
Wisconsin	42,148	17,000	71,886	462,913	551,799
Wyoming	203	2,323	2,323	6,191	10,837
Total	945,464	658,415	1,715,259	4,575,282	6,948,956

TABLE 11.—*Planting stock available for forest and windbarrier planting on State and private lands, area planted or seeded, and plantable area by States*

State and territory	Planting stock shipped, fiscal year 1959			Area planted or seeded fiscal year 1959 [2]	Plantable area as of Jan. 1, 1953 [3]
	State nurseries	Other	Total [1]		
	Thousands	*Thousands*	*Thousands*	*Acres*	*Acres*
Alabama	165, 629	34, 408	200, 037	211, 852	1, 675, 000
Alaska					
Arizona	0	18	18	40	18, 000
Arkansas	77, 365	0	77, 365	78, 289	1, 408, 000
California	3, 060	330	3, 390	3, 908	3, 357, 000
Colorado	175	508	683	1, 442	295, 000
Connecticut	2, 130	0	2, 130	1, 409	205, 000
Delaware	838	0	838	904	34, 000
Florida	139, 779	84, 550	224, 329	195, 820	4, 859, 000
Georgia	292, 577	69, 414	361, 991	329, 625	1, 566, 000
Hawaii	358	0	358	653	
Idaho	821	0	821	1, 057	265, 000
Illinois	8, 625	0	8, 625	6, 777	2, 856, 000
Indiana	11, 047	0	11, 047	6, 333	1, 290, 000
Iowa	1, 436	225	1, 661	1, 635	613, 000
Kansas	0	2, 330	2, 330	2, 134	915, 000
Kentucky	5, 148	8, 461	13, 609	15, 482	1, 500, 000
Louisiana	128, 577	16, 796	145, 373	192, 987	1, 139, 000
Maine	335	1, 771	2, 106	1, 893	472, 000
Maryland	5, 746	0	5, 746	5, 214	250, 000
Massachusetts	1, 056	0	1, 056	1, 056	114, 000
Michigan	15, 528	44, 997	60, 525	36, 653	2, 905, 000
Minnesota	20, 100	2, 999	23, 099	21, 368	2, 410, 000
Mississippi	105, 113	50, 534	155, 647	162, 362	4, 187, 000
Missouri	5, 099	1, 000	6, 099	4, 502	1, 267, 000
Montana	976	1, 330	2, 306	1, 988	214, 000
Nebraska	0	4, 890	4, 890	5, 644	968, 000
Nevada	23	0	23	40	28, 000
New Hampshire	3, 950	150	4, 100	2, 542	309, 000
New Jersey	1, 190	150	1, 340	838	93, 000
New York	39, 354	1, 274	40, 628	39, 154	1, 250, 000
New Mexico	0	29	29	24	97, 000
North Carolina	86, 269	10, 000	96, 269	84, 700	898, 000
North Dakota	1, 507	7, 274	8, 781	12, 050	742, 000
Ohio	14, 623	1, 400	16, 023	14, 322	729, 000
Oklahoma	5, 376	0	5, 376	6, 450	876, 000
Oregon	10, 092	20, 573	30, 665	42, 812	969, 000
Pennsylvania	15, 189	22, 493	37, 682	42, 175	1, 080, 000
Puerto Rico	780	0	780	1, 897	
Rhode Island	230	22	252	215	39, 000
South Carolina	123, 985	24, 285	148, 270	155, 238	1, 169, 000
South Dakota	0	4, 968	4, 968	6, 822	702, 000
Tennessee	52, 270	15, 224	67, 494	62, 478	1, 465, 000
Texas	63, 308	20, 022	83, 330	70, 749	539, 000
Utah	80	92	172	165	37, 000
Vermont	3, 218	0	3, 218	3, 218	99, 000
Virginia	38, 700	0	38, 700	38, 083	1, 799, 000
Washington	17, 088	10, 396	27, 484	48, 365	751, 000
West Virginia	6, 208	1, 231	7, 439	6, 993	989, 000
Wisconsin	37, 099	13, 646	50, 745	51, 628	2, 685, 000
Wyoming	0	244	244	591	95, 000
Total	1, 512, 057	478, 034	1, 990, 091	1, 982, 576	52, 222, 000

[1] Represents planting stock produced within each State adjusted for known significant shipments of stock from one State to another.

[2] Includes 84,011 acres of direct seeding primarily in Alabama, Louisiana, Oregon, and Washington. It is estimated that not more than 80 percent of these plantings and seedings are successful.

[3] Figures are those reported in "Timber Resources for America's Future." Alaska, Hawaii, and Puerto Rico were not included in the timber resources study.

TABLE 12.—*Cooperative forest management accomplishments and expenditures, fiscal year 1959*[1]

(U.S. Forest Service and State foresters cooperating in 424 projects)

States and territory	Accomplishments				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*Thousand board feet*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	327	46, 618	2, 135	52, 094	16, 972	16, 972	33, 944
Arkansas	1, 479	133, 490	1, 085	15, 081	25, 975	31, 164	57, 139
California	882	199, 498	93, 664	1, 590, 241	29, 220	68, 926	98, 146
Colorado	146	13, 939	905	8, 924	10, 000	22, 570	32, 570
Connecticut	907	18, 649	3, 240	49, 185	18, 940	21, 020	39, 960
Delaware	58	2, 450	601	17, 300	3, 755	3, 782	7, 537
Florida	2, 855	849, 790	26, 735	620, 250	54, 370	134, 853	189, 223
Georgia	3, 470	265, 847	22, 584	538, 284	51, 990	122, 808	174, 798
Idaho	269	40, 205	10, 309	97, 198	5, 150	11, 139	16, 289
Illinois	1, 236	28, 794	4, 523	174, 678	41, 694	75, 482	117, 176
Indiana	1, 131	41, 935	6, 026	173, 915	13, 070	49, 136	62, 206
Iowa	780	19, 730	1, 222	34, 536	15, 098	20, 219	35, 317
Kansas	69	3, 506	190	7, 900	5, 591	5, 591	11, 182
Kentucky	2, 382	53, 163	4, 211	116, 985	45, 275	72, 180	117, 455
Louisiana	595	54, 616	5, 409	89, 474	26, 320	26, 362	52, 682
Maine	2, 877	72, 207	19, 155	336, 070	45, 325	62, 977	108, 302
Maryland	1, 590	29, 394	6, 192	170, 609	34, 905	50, 875	85, 780
Massachusetts	277	8, 519	3, 202	43, 805	7, 490	8, 108	15, 598
Michigan	3, 522	124, 857	21, 912	383, 743	52, 767	88, 909	141, 676
Minnesota	3, 033	50, 694	14, 123	371, 425	24, 815	43, 435	68, 250
Mississippi	3, 030	229, 403	3, 530	83, 757	27, 395	32, 225	59, 620
Missouri	1, 817	191, 297	14, 364	287, 814	57, 071	64, 932	122, 003
Montana	490	44, 503	1, 621	36, 513	16, 122	19, 531	35, 653
Nebraska	280	2, 967	288	16, 800	6, 300	8, 699	14, 999
Nevada	0	0	0	0	453	453	906
New Hampshire	1, 888	69, 716	7, 687	186, 629	27, 070	32, 389	59, 459
New Jersey	776	58, 139	4, 925	81, 201	23, 235	32, 221	55, 456
New York	5, 082	305, 951	42, 323	1, 044, 395	93, 270	134, 517	227, 787
North Carolina	4, 139	111, 163	18, 744	488, 406	52, 345	58, 017	110, 362
North Dakota	323	826	530	31, 237	7, 947	9, 718	17, 665
Ohio	2, 658	53, 503	5, 613	181, 023	53, 825	71, 040	124, 865
Oklahoma	794	1, 386	114	7, 500	7, 204	7, 204	14, 408
Oregon	1, 719	41, 713	15, 307	380, 620	14, 230	14, 230	28, 460
Pennsylvania	2, 947	66, 885	9, 536	201, 401	47, 615	88, 047	135, 662
Rhode Island	275	30, 174	346	3, 181	4, 760	8, 862	13, 622
South Carolina	1, 865	186, 595	20, 334	565, 083	38, 550	78, 978	117, 528
South Dakota	105	13, 102	2, 670	19, 476	12, 000	12, 381	24, 381
Tennessee	945	85, 552	26, 941	674, 490	30, 869	39, 153	70, 022
Texas	851	96, 837	773	6, 267	24, 360	35, 591	59, 951
Utah	89	1, 576	662	11, 172	6, 173	6, 173	12, 346
Vermont	2, 956	56, 746	13, 089	373, 918	50, 840	71, 007	121, 847
Virginia	3, 762	207, 146	190, 725	2, 877, 446	84, 417	211, 106	295, 523
Washington	2, 761	66, 947	12, 129	290, 928	20, 565	36, 249	56, 814
West Virginia	1, 147	33, 227	3, 747	71, 956	31, 357	59, 175	90, 532
Wisconsin	7, 388	132, 522	16, 388	440, 358	78, 017	304, 064	382, 081
Total, U.S.	75, 972	4, 145, 777	659, 809	13, 253, 268	1, 344, 712	2, 372, 470	3, 717, 182
Puerto Rico	574	369	41	248	8, 500	18, 650	27, 150
Grand total	76, 546	4, 146, 146	659, 850	13, 253, 516	1, 353, 212	2, 391, 120	3, 744, 332

[1] Performed under authority of Cooperative Forest Management Act of August 25, 1950.

TABLE 13.—*Pest control accomplishments and costs, calendar year 1959*

WHITE PINE BLISTER RUST

Ownership or management	Premaintenance work to establish control		Maintenance work		Area on which control was established	Area surveyed, mapped, or otherwise inspected	Ribes plants eradicated	Trees treated with antibiotics	Labor used
	New work	Rework	Area treated to remove Ribes	Area examined and found Ribes free					
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Number*	*Number*	*Man-days*
National forests	15, 268	71, 563	18, 053	72, 205	29, 774	243, 353	6, 400, 240	3, 592, 817	55, 337
Department of Interior:									
National parks	4, 532	9, 892	7, 415	10, 813	4, 106	60, 963	1, 208, 669	38, 000	9, 667
Bureau of Land Management	248	4, 132	550	6, 477	2, 260	11, 229	91, 000	2, 354	1, 788
Indian lands	795	494	1, 741	2, 211	362	11, 556	424, 000	----------	1, 595
Subtotal, USDI	5, 575	14, 518	9, 706	19, 501	6, 728	83, 748	1, 723, 669	40, 354	13, 050
All Federal	20, 843	86, 081	27, 759	91, 706	36, 502	327, 101	8, 123, 909	3, 633, 171	68, 387
State and private	37, 525	93, 266	52, 060	1, 127, 692	112, 292	2, 138, 115	4, 823, 447	480, 000	41, 211
All ownerships	58, 368	179, 347	79, 819	1, 219, 398	148, 794	2, 465, 216	12, 947, 356	4, 113, 171	109, 598

OAK WILT

Ownership or management	Area surveyed aerially	Trees treated	Funds expended		
			Federal	State	Total
	Thousand acres	*Number*	*Dollars*	*Dollars*	*Dollars*
National forests	4, 121	19	5, 200	0	5, 200
Interior lands	1	36	357	0	357
State and private:					
Arkansas	8, 000	360	2, 875	4, 671	7, 546
Kentucky	4, 915	611	14, 687	32, 639	47, 326
North Carolina	12	127	2, 118	4, 235	6, 353
Pennsylvania	10, 000	692	11, 578	34, 734	46, 312
Virginia	2, 624	30	1, 630	4, 890	6, 520
West Virginia	15, 411	2, 232	24, 640	51, 878	76, 518
All State and private	40, 962	4, 052	57, 528	133, 047	190, 575
Total, all ownerships	45, 084	4, 107	63, 085	133, 047	196, 132

DWARFMISTLETOE

Region	Acres surveyed	Acres treated	Trees treated	Cost
Northern Rocky Mountain	1, 219	200	18, 291	$6, 171. 09
Rocky Mountain	775	775	22, 875	4, 340. 00
California	38, 850	----------	----------	6, 294. 16
Pacific Northwest	1, 099	934	23, 959	15, 920. 98
All regions	41, 943	2, 928	65, 125	32, 726. 23

TABLE 13.—*Pest control accomplishments and costs, calendar year 1959*—Continued

INSECTS

Ownership or management	Bark beetles		Spruce budworm		Miscellaneous insects	
	Trees treated	Control costs	Area treated	Control costs	Area treated	Control costs
	Number	*Dollars*	*Acres*	*Dollars*	*Acres*	*Dollars*
National forests	[1] 678, 092	1, 310, 430	115, 388	123, 211	25, 479	55, 877
Interior lands	9, 547	114, 587	0	0	6, 085	82, 650
State and private lands	[1] 6, 971	48, 900	18, 733	9, 746	21, 782	22, 682
All ownerships	694, 610	1, 473, 917	134, 121	132, 957	53, 346	161, 209

[1] Includes infested trees, cull logs, and stumps.

TABLE 14.—*Statement of Forest Service receipts and expenditures, all programs and sources, fiscal year 1959*

Item	Receipts	Expenditures
National forest programs:		
Cash receipts and appropriation expenditures	$142, 735, 253	$140, 158, 477
Noncash income and expense (roads built by timber purchasers)	39, 650, 633	39, 650, 633
Total	$182, 385, 886	$179, 809, 110
Research programs:		
Forest research appropriations		16, 448, 113
Cooperative research work	1, 009, 755	973, 188
Total	$1, 009, 755	$17, 421, 301
State and private forestry programs:		
State and private appropriations		$12, 796, 691
Conservation Reserve program		2, 506, 852
Assistance to States for tree planting		7, 000
Insect and disease control		1, 060, 460
Flood prevention and watershed protection		1, 423, 294
Forest fire prevention, "Smokey Bear"	15, 453	25, 737
Cooperative work	1, 655, 746	1, 618, 118
Total, State and private forestry programs	$1, 671, 199	$19, 438, 152
Work for others:		
Insect and disease control (Interior Department lands)		$66, 878
Cooperative work—work performed for private individuals, firms, etc	$2, 454, 607	2, 254, 551
Services performed for other Government agencies	5, 061, 229	[1] 5, 446, 810
Total, work for others	$7, 515, 836	$7, 768, 239
Total	$192, 582, 676	$224, 436, 802

[1] Includes transfer of funds from other Government agencies and departments.

Note: Expenditures are on an obligation basis.

Cash receipts distributed to States, Territories, and counties as directed by Congress (Receipts of F.Y. 1958 except as indicated):		
Payments to States and Territories (Act 5/23/08), National Forest fund		[1] $22, 204, 787
Payments to school funds, Arizona and New Mexico (Act 6/20/10), National Forest fund		117, 161
Payment to Minnesota (Cook, Lake, and St. Louis Counties) (Superior National Forest, Act 6/22/48), National Forest fund		48, 240
Payment to counties, submarginal land program, Title III, Farm Tenant Act of July 22, 1937 (receipts of C.Y. 1958)		460, 109
Total		$22, 830, 297
Internal equipment and supply services (Working Capital fund)—financed primarily by charges to Forest Service programs, included above	$15, 680, 569	$15, 059, 704

[1] Does not include approximately $2,572,117 due counties from F.Y. 1958 receipts on national-forest O&C lands. This amount was included in transfer to Interior for distribution under Act of August 28, 1937 (50 Stat. 874) as amended.

U.S. GOVERNMENT PRINTING OFFICE: 1960